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**Terminal 5  
Preliminary Assessment Appendix II**

**Port of Portland**

**USEPA SF**



**1286501**

**Attachment H**  
**2000 Sediment Characterization Study**  
**Terminal 5 Berths 501 and 503**  
**Port of Portland Terminal 5**



***Sampling and Analysis Plan for  
Sediment Characterization at  
Marine Terminal 5, Barge Berth 501  
and Berth 503***

***Prepared for  
Port of Portland***

***February 1, 2000  
J-5930***

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## ACRONYMS

BT	Bioaccumulation Triggers
COC	Chemical of Potential Concern
Corps	U.S. Army Corps of Engineers
CRD	Columbia River Datum
DEQ	Oregon Department of Environmental Quality
DGPS	Differential Global Positioning System
DMMU	Dredge Material Management Unit
EPA	United States Environmental Protection Agency
LCRMA	Dredged Material Evaluation Framework - Lower Columbia River Management Area
ML	Maximum Level
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyl
Port	Port of Portland
PSDDA	Puget Sound Dredged Disposal Analysis
QA/QC	Quality Assurance/Quality Control
SL	Screening Level
TBT	Tributyltin

- Composite and analyze sediment cores in a timely manner to meet the Port's maintenance dredging schedule and LCRMA requirements for sample holding times.

## **3.0 PROJECT TEAM AND RESPONSIBILITIES**

The sediment characterization program will include: 1) project planning and agency coordination; 2) field sample collection; 3) laboratory preparation and analysis; 4) QA/QC management; and 5) final data report. Staffing and responsibilities are outlined below.

### ***3.1 Project Planning and Coordination***

Mr. Sebastian Degens, of the Port, is the applicant's representative and the primary contact for administrative issues related to the Port's maintenance dredging program. Mr. Howard Cumberland of Hart Crowser's Portland, Oregon office will be the overall project manager responsible for developing and completing the sampling program, and the primary contact for technical issues related to this sampling plan and the sediment characterization report. Mr. Cumberland will be responsible for timely and successful completion of the project.

### ***3.2 Field Sample Collection***

Mr. Cumberland will provide overall direction to the field sampling and laboratory analysis programs in terms of logistics, personnel assignments, field operations, and analytical laboratory selection. Mr. Keith Kroeger will supervise field collection of the sediment core samples. Mr. Kroeger will also be responsible for assuring accurate sample positioning; recording sample locations, depths, and identification; assuring conformance to sampling and handling requirements including field decontamination procedures; photographing, physical evaluation, and logging the samples; and for chain of custody of the sample cores until they are delivered to the analytical laboratory.

### ***3.3 Laboratory Preparation and Analyses***

Mr. Cumberland will be responsible for documenting sample preparation, observations, and chain of custody. The sediment samples for chemical analysis will be delivered to Columbia Analytical Services in Kelso, Washington. Additionally, sediment samples for biological testing will be delivered to Northwestern Aquatic Sciences in Newport, Oregon. Grain size analysis for sediment samples will be completed by Hart Crowser in Seattle, Washington. Mr. Cumberland will instruct the analytical laboratories on the need to maintain

required handling and analytical protocols including detection limit requirements for dredge material characterization. Mr. Cumberland will ensure that archived sediments are stored under proper conditions.

Mr. Richard Craven, Project Chemist at Columbia Analytical Services will be responsible for chemical analysis. Dr. Richard S. Caldwell, Senior Scientist at Northwestern Aquatic Sciences will be responsible for biological testing. Mr. Grant Knechtel, Senior Geologist at Hart Crowser will be responsible for grain size analyses. Columbia Analytical Services, Northwestern Aquatic Sciences, and Hart Crowser will handle and analyze the submitted samples in accordance with LCRMA analytical testing protocols and QA/QC requirements. A written report of analytical results and QA/QC data will be prepared by Columbia Analytical Services, Northwestern Aquatic Sciences, and Hart Crowser and included as an appendix in the final report.

### **3.4 QA/QC Management**

Dr. Taku Fuji, will serve as Quality Assurance Representative for the sediment characterization project. He will perform quality assurance oversight for both the field sampling and laboratory programs. Dr. Fuji will stay fully informed of field program procedures and progress during sample collection, and laboratory activities during sample preparation and analysis. He will record and correct any activities which vary from the written sampling and analysis plan. He will also review the laboratory analytical and QA/QC data to assure that data are valid and procedures meet the required analytical quality control limits. Upon completion of the sampling and analytical program, Dr. Fuji will incorporate findings into a QA/QC report.

### **3.5 Final Data Report**

Mr. Cumberland and Dr. Fuji will provide technical oversight and review of the Final Data Report and the data analysis it contains. They will also be responsible for preparation of the Final Data Report, including descriptions of sample locations and depths; sampling, handling, and analytical methods; QA/QC; and compilation and interpretation of data.

## **4.0 SAMPLE COLLECTION AND HANDLING PROCEDURES**

### **4.1 Definitions**

The following definitions apply to this sampling program:

- **Dredging Prism.** The entire volume of sediments to be dredged including related side-slopes and two-foot overdredge (Berth 501-Face berthing area to maintain a depth of -42 feet CRD; Berth 501-Barge berthing area to maintain a depth of -15 feet CRD; and Berth 503 to maintain berthing depths of -42 feet CRD).
- **Sampling Depth (Penetration Depth).** The entire cumulative depth of penetration of the coring device from the sediment/water interface.
- **Sediment Core.** The entire cumulative length of sediment core extracted by the coring device. Typically, the recovered sediment length is less than the total penetration depth because of compaction during coring. Each sediment core is identified by number in Table 1 and on Figures 4, 5, and 6.
- **Dredged Material Management Unit (DMMU).** The volume of dredged material for which a separate decision on suitability for unconfined open-water disposal can be made. DMMUs are represented by physical, chemical, and biological testing of a single sample, composited from cores within the DMMU. In accordance with the LCRMA (Corps et al., 1998), the number of samples required of a proposed project will be determined on a case-by-case basis depending on: suspected contamination in surface and subsurface sediments, the heterogeneity of the sediment, the project rank, the areal extent of the DMMU, and the proposed depth of dredging. The proposed intensity of sampling for the Berths at Terminal 5 are presented in Table 1.
- **Core Section.** The length of each core section will vary depending on the sediment depth at each sample location. Each core sample will be taken at sediment high spots within each DMMU in order to test the maximum amount of sediment that is proposed for dredging. For each DMMU, with exception to DMMU T501-Barge, individual cores will be composited into one sample per DMMU for laboratory analyses.
- **Subsurface Sediments.** Material encountered within the sediment core for use in compositing and subsequent physical, chemical, and biological analyses.

#### **4.2 Number of Samples Required**

The numbers of samples proposed for each terminal were selected in accordance with the LCRMA (Corps et al., 1998). This manual presents a classification scheme for ranking DMMUs as high, moderate, low-moderate, and low. In that order, these ranks represent a best professional judgment of concern for potential risk, typically reflective of a scale of decreasing potential

for adverse biological effects or decreasing concentration of chemicals of potential concern (COPC). Based on an evaluation of available data and discussions with Mr. Sebastian Degens, this project has been conservatively rated as moderate and the intensity of sediment sampling developed accordingly. Therefore, following LCRMA guidance, the maximum volume of sediment that can be represented by a single chemical analysis is 20,000 cubic yards.

The proposed dredge prisms at Terminal 5 will be divided into three separate DMMU's for characterization. DMMU T501-Face will encompass the dredge material at Berth 501-Face berthing area and DMMU T501-Barge will encompass the dredge material at Berth 501-Barge berthing area. DMMU T503 will encompass the dredge material present at Berth 503.

The estimated volume of materials to be dredged is:

- 362 cubic yards at Terminal 5, Berths 501(DMMU T501-Face);
- 736 cubic yards at Terminal 5, Berths 501(DMMU T501-Barge); and
- 1,032 cubic yards at Terminal 5, Berth 503 (DMMU T503).

To characterize this dredge material, we propose to submit one sample from DMMU T501-Face, one sample from DMMU T501-Barge, and one sample from DMMU T503.

#### ***4.3 Sampling and Compositing Scheme***

The sampling and analysis program is developed with consideration of site-specific project and environmental factors. A key requirement is assuring that if an individual DMMU is found unsuitable for unconfined open water disposal, then that unit can be feasibly dredged independently from surrounding clean sediments so that the contaminated material can be disposed of at an alternate approved confined in-water site.

##### **4.3.1 Sampling Scheme**

Basic criteria for selecting sampling locations and compositing for analysis are contained in the recently developed Draft LCRMA guidance (Corps et al., 1998).

**Sample Locations.** The sampling locations at each DMMU will be established as shown on Figures 2 and 3. At the Berth 501 - Face berthing area, two sediment cores will be collected for the DMMU T501-Face (Figure 4). The two sediment cores will be homogenized together and submitted for chemical

analysis. One sediment core will be collected from the Berth 501-Barge berthing area for the DMMU T501-Barge (Figure 5). At Berth 503, two cores will be collected for the T503 DMMU (Figure 6). The two sediment cores will be homogenized together and submitted for chemical analysis.

**Core Sampling Depths.** At the Berth 501-Face berthing area, sediment cores at each location will be collected from the sediment-water interface down to an elevation of -43 feet CRD (i.e., to the design and overdredge elevation of -42 feet CRD plus one foot of sample for archive purposes). At the Berth 501 barge berthing area, the sediment core will be collected from the sediment-water interface down to an elevation of -18 feet CRD (i.e., to the design and overdredge elevation of -17 feet CRD plus one foot of sample for archive purposes). At Berth 503, sediment cores at each location will be collected from the sediment/water interface down to an elevation of -43 feet CRD (i.e., to the design and overdredge elevation of -42 CRD feet plus one foot of sample for archive purposes). See Figures 4 through 6 for graphical representation.

#### **4.3.2 Compositing Scheme**

Sample compositing will be conducted for each proposed DMMU, with exception to DMMU T501-Barge (See Table 1). The goal of sample compositing is to control analytical chemistry costs while maintaining the overall objective of obtaining an accurate representation and definition of the dredging area.

#### **4.4 Field Sampling Schedule**

The field sampling schedule is constrained by the shortest sample holding time (seven days). To safely meet the holding times for composited samples, the field samples will be composited and delivered for laboratory testing within three days of sampling. It is projected that the entire sampling program at Terminal 5 can be completed within one working day.

Initiation of sediment sampling will be preceded by preparation and cleaning of sample coring and handling equipment, acquisition of appropriate EPA-approved decontaminated sample containers from the analytical laboratory, and establishment of sampling locations along the river terminals.

#### **4.5 Field Operations and Equipment**

The field crew will be mobilized from Hart Crowser's Portland office. The field crew will make sure all equipment is in good working order prior to initiating the sampling program. All field sampling and sediment handling will conform to the procedures outlined in the Health and Safety Plan presented in Appendix A.

#### **4.5.1 Sediment Sampling Equipment**

The sampling vessel and operator to be employed for the sampling program will be provided by Marine Sampling Systems of Seattle, Washington. The sampling vessel, R/V Nancy Anne, is an aluminum, flat-deck, 36-foot-long and 14 foot-wide, catamaran vessel with twin 120-horsepower engines. The R/V Nancy Anne is equipped with a 14-foot-high hydraulically operated A-frame boom with variable speed, 3,000-pound capacity, hydraulic winch (1 to 3 ft/sec), and 270 square feet of deck space. The vessel is also equipped with a pilot house and fresh water and seawater pumps. The vessel draft ranges from 18 inches forward to 42 inches aft.

Subsurface sediment collection will be performed using a vibracore. The vibracore is a sediment collection instrument consisting of a 4-inch-diameter aluminum core tube attached to a vibrating head that operates at approximately 10,000 cycles per minute, thus vibrating the core tube down into the sediment. Sediment is retained in the tube by a catcher, extracted from the harbor bottom, and the sample is brought on board the sampling vessel for processing.

The field representative will log each sample on a chain of custody form, noting the location, date, and time of collection. Subsequent chain of custody forms will be used to track the submittal of specific samples to the laboratory. A complete record of drilling and sampling operations will be maintained on the Sediment Sampling Form shown on Figure 7. Soil descriptions will be prepared using the system shown on the Key to Sediment Logs, which is presented on Figure 8.

#### **4.5.2 Positioning**

The objective of the positioning procedure is to accurately ( $\pm 3m$ ) determine and record the positions of all sampling locations. This determination will be achieved by referencing each sampling location to state plane coordinates with the use of known survey control points and DGPS.

The following parameters will be documented at each sampling location:

- Horizontal location in state plane coordinates, as appropriate;
- Vertical elevation in feet (including mudline and river elevation);
- Time and date; and
- River elevation referenced to Columbia River Datum.

These parameters will be measured using combinations of DGPS, river elevation gages, and back up methods (i.e., triangulation or taping to survey control points and/or terminal landmarks or structures).

Positioning while sampling will be performed using a DGPS that will provide positions every second with the potential for sub-meter accuracy for precise positioning of sample locations. The navigation system onboard the vessel will provide the vessel pilot with a navigation display to enable piloting to sample locations and recording of the exact location of the sediment core. As a back up, the visual horizontal triangulation method is proposed. Sampling locations will be identified by measuring the horizontal distance from the actual sampling location to a known survey control point and/or permanent structure to the nearest foot using an incremental tape measure. These horizontal measurements can be translated into state plane coordinates using project base maps.

#### **4.5.3 Sample Collection Techniques**

Sediment samples will be collected in the following manner:

- Vessel will maneuver to proposed sample locations and will anchor upstream of the proposed sample location.
- A decontaminated 14 foot aluminum core tube will be secured to the vibratory assembly and deployed from the vessel.
- The cable to the vibracore will be drawn taut and perpendicular, as the core rests on the bottom sediment.
- Location of the vibracore and depth to sediment will be measured with a survey tape attached to the head assembly.
- A 4-inch, thin-walled, aluminum tube will be vibratory-driven into the sediment using the vibracore.
- A continuous core sample will be collected to the full length of the core tube or until refusal.
- The depth of core penetration will be measured and recorded.
- The vibracore will be turned off and the core barrel will be extracted from the sediment using the winch.
- While suspended from the A-frame, the assembly and core barrel will be sprayed off and then placed on the vessel deck.

- The core sample will be evaluated at the visible ends of the core tube to ensure that retrieved sediment core reached the required depth.

Sample recovery will be inspected relative to the following Hart Crowser acceptance criteria:

- Overlying water is present and the surface is intact;
- Calculated sediment compaction is not greater than 40 percent; and
- The core tube appears intact without obstruction or blocking.

Once the core samples are deemed acceptable, the cutter head will be removed and a cap will be placed over the end of the tube and secured firmly in place with duct tape. The core will then be removed from the sampler and the other end of the core will be capped and taped. A label identifying the core will be securely attached to the outside of the core and wrapped with transparent tape to prevent loss or damage of the label. The core sections will be stored on Blue Ice in coolers. The cores will be sealed tightly enough to prevent leakage or disturbance during transport.

As samples are collected, logs and field notes of all sediment samples will be maintained in a project notebook. Included in this log will be the following:

- Calculated elevation of each sediment sample as measured from the Columbia River Datum (CRD);
- Date and time of sampling;
- Initials of person supervising the sampling operation;
- Weather conditions;
- Sample location number and core section identification;
- Physical description of sediment; and
- Chronological occurrence of events during sampling operations.

#### **4.6 Equipment Decontamination Procedures**

Sampling and sediment compositing equipment will be thoroughly cleaned prior to use and after each sample collection event. Sampling equipment will be decontaminated according to the following procedure:

- Wash with brush and Alconox soap;

- Rinse with tap water; and
- Rinse with deionized water.

After cleaning, all sampling equipment will be wrapped in foil or plastic to limit the risk of contamination.

All hand work (e.g., using stainless steel spoons for extracting the sample from the split cores, mixing the samples and filling sample containers) will be conducted with disposable latex gloves which will be rinsed with distilled water before and after handling each individual sample, as appropriate, to prevent sample contamination. Gloves will be disposed of between composites to prevent cross contamination between the DMMUs.

## ***4.7 Sample Compositing and Subsampling***

### **4.7.1 Extrusion**

Core sections will have their sealed caps removed for extrusion. The sediment from each sample tube will be extruded onto a stainless steel tray using a stainless steel spoon. The sample will be disturbed as little as possible when extruding. The spoon will be decontaminated between each use. Upon extrusion, the core will be split with a decontaminated stainless steel wire core splitter.

A color photograph will be taken and the sediment description of each core sample will be recorded on the sediment sampling log for the following parameters as appropriate and present:

- Sample recovery;
- Physical soil description in accordance with the Unified Soil Classification System (includes soil type, density/consistency of soil, color);
- Odor (e.g., hydrogen sulfide, petroleum);
- Visual stratification, structure, and texture;
- Vegetation;
- Debris;
- Biological activity (e.g., detritus, shells, tubes, bioturbation, live or dead organisms);

- Presence of oil sheen; and
- Any other distinguishing characteristics or features.

#### **4.7.2 Compositing**

Samples will be composited by Hart Crowser per the compositing plan presented in Table 1 and in accordance with LCRMA guidance. For sediment composite samples, equal volumes of sediment will be removed from each core section comprising a composite. Sediments representing each composite sample will be placed in a stainless steel bowl and mixed using stainless steel mixing spoons or paddles. The composited sediment in the stainless steel bowl will be mixed until homogenous in color and texture.

#### **4.7.3 Sample Volume**

Approximately three liters of homogenized sample will be prepared to provide adequate volume for physical and chemical laboratory analyses. An additional four liters of sediment will be prepared for biological analyses. Portions of each composite sample will be placed in appropriate containers obtained from the analytical chemistry laboratories. See Table 2 for container and sample size information.

Each sample container will be clearly labeled with the project name, sample/composite identification, type of analysis to be performed, date and time, initials of person(s) preparing the sample, and referenced by entry into the logbook. Samples will be stored at approximately 4°C until withdrawn for analysis.

### **4.8 Sample Transport and Chain of Custody Procedures**

Containerized sediment samples will be transported to the appropriate laboratories (See Section 3.3) for analyses after compositing is completed. Specific sample shipping procedures will be as follows:

- Each cooler or container containing the sediment samples for analysis will be delivered to the laboratory within 24 hours of being sealed.
- Individual sample containers will be packed to prevent breakage and transported in a sealed ice chest or other suitable container.
- The shipping containers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the container and consultant's office name and address) to enable positive identification.

- Glass jars will be separated in the shipping container by shock absorbent material (e.g., bubble wrap) to prevent breakage.
- Ice will be placed in separate plastic bags and sealed.
- A sealed envelope containing custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler.
- Signed and dated custody seals will be placed on all coolers prior to shipping.

Upon transfer of sample possession to the designated laboratories, the custody form will be signed by the persons transferring custody of the sample container. Upon receipt of samples at the laboratory, the shipping container seal will be broken and the condition of the samples will be recorded by the receiver. Custody forms will be used internally in the lab to track sample handling and final disposition.

## 5.0 LABORATORY PHYSICAL AND CHEMICAL SEDIMENT ANALYSIS

### 5.1 *Chemical Analyses Protocols*

Laboratory testing procedures will be conducted in accordance with LCRMA guidance (Corps et al., 1998). Several details of these procedures are discussed below.

#### **5.1.1 Chain of Custody**

A chain of custody record for each set of samples will be maintained throughout all sampling activities and will accompany samples and shipment to the laboratory. Information tracked by the chain of custody records in the laboratory include sample identification number, date and time of sample receipt, analytical parameters required, location and conditions of storage, date and time of removal from and return to storage, signature of person removing and returning the sample, reason for removing from storage, and final disposition of the sample.

#### **5.1.2 Limits of Detection**

The sediment composite samples identified in Table 1 will be analyzed for each of the parameters listed in Table 3. The analytical test methods and method detection limits to be achieved by the analytical laboratory are identified in Table 3. The testing laboratories are aware of the LCRMA detection limit requirements and will employ all reasonable means, including additional cleanup

steps and method modifications, to bring detection limits below these screening levels. In addition, an aliquot (8 oz) of each composited sediment sample will be archived (frozen) at -20°C for additional analysis if necessary.

In all cases, to avoid potential problems and leave open the option for retesting, sediments or extracts will be kept under proper storage conditions until the chemistry data are deemed acceptable by the Corps and DEQ.

#### **5.1.3 Holding Times**

All samples for physical and chemical testing will be maintained at the testing laboratory in accordance with the sample holding limitations and storage temperature requirements listed in Table 2.

#### **5.1.4 Quality Assurance/Quality Control**

The chemistry QA/QC requirements found in Table 4 will be met.

### **5.2 Biological Testing**

Tier III biological testing is proposed for sediment samples that exceed LCRMA screening levels (Table 4). Tier III biological testing will not be done on samples that do not exceed Tier II screening level requirements (Corps et al., 1998). A variety of site-specific factors—including chemical speciation, mobility, and bioavailability—affect the ability of a contaminant to produce a toxic response in biota. Thus, the chemical concentration which corresponds to no adverse effects may vary from location to location for potential contaminants of concern, and confirmatory biological testing is proposed when LCRMA screening levels are exceeded to better define sediment cleanup areas.

If necessary, the following sediment toxicity tests are proposed for confirmatory biological testing:

- Acute 10-Day Amphipod Survival Test (*Hyalella azteca*), and
- Acute/Chronic 10-Day Midge Survival and Growth Test (*Chironomus tentans*).

These freshwater sediment toxicity tests will be conducted in accordance with available standard protocols (EPA, 1994 and ASTM, 1995). Sediment toxicity test results will be interpreted against the decision criteria provided in the draft LCRMA (Corps et al., 1998). The reference area/control performance criteria and decision criteria for interpreting the results of each toxicity test are provided in Table 5. Reference sediment for use in these sediment toxicity tests will be

collected from a suitable reference location in the Columbia River (Figure 9). Three reference sites were recently sampled and tested for physical and chemical characteristics. In addition, these samples were submitted for freshwater sediment toxicity testing to ensure that they met the performance criteria for use as reference sediments. The specific reference site that will be selected for this investigation will be determined by matching the grain size characteristics of the test sediment to those reported for the three potential reference sediments. Based on previous grain size data from the study area, the reference sediment that most closely matches the grain size characteristics of the test sediment is Reference Site B (Figure 9).

### **5.3 Laboratory Written Report**

A written report will be prepared by the analytical laboratories documenting the activities associated with sample analyses. As a minimum, the following will be included in the report:

- Results of the laboratory analyses and QA/QC results;
- Protocols used during analyses;
- Chain of custody procedures, including explanation of any deviation from those identified herein;
- Any protocol deviations from the approved sampling plan; and
- Location and availability of data.

As appropriate, this sampling plan may be referenced in describing protocols.

## **6.0 REPORTING**

### **6.1 QA Report**

The project quality assurance representative will prepare a quality assurance (QA) report based upon activities involved with the field sampling and review of the laboratory analytical data. The laboratory QA/QC report will be incorporated into the final Hart Crowser QA Report. The QA report will identify any field and laboratory activities that deviated from the approved sampling plan and the referenced protocols and will make a statement regarding the overall validity of the data collected.

## **6.2 Final Report**

Hart Crowser will prepare a written report documenting all activities associated with collection, compositing, transportation, and analysis of samples. The chemical testing reports from the analytical laboratory will be included as appendices. At a minimum, the following will be included in the final report:

- Type of sampling equipment used;
- Protocols and procedures used during sampling and testing and an explanation of any deviations from the sampling plan protocols;
- Descriptions and core logs of each sample, including penetration and recovery depths, compositing intervals, mudline elevation, grain size, and geologic contacts;
- Methods used to locate the sampling positions within an accuracy of  $\pm 3\text{m}$ ;
- Maps and tables identifying locations where the sediment samples were collected and reported in latitude and longitude to the nearest tenth of a second on State Plane Coordinates;
- A plan view of the project site showing the terminal, bathymetry, and actual sampling locations;
- Chain of custody procedures used, and explanation of any deviations from the sampling plan procedures;
- Tabular summary of chemical testing results, with comparisons to LCRMA screening levels;
- Biological testing results and interpretation, if conducted; and
- Final QA report as discussed above.

## **7.0 REFERENCES**

ASTM, 1995. Standard Test Methods for Measuring the Toxicity of Sediment-Associated Contaminants with Fresh Water Invertebrates. E 1706-95.

Corps et al., 1998. Dredged Material Evaluation Framework, Lower Columbia River Management Area. Draft April 1998.

EPA, 1994. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-Associated Contaminants with freshwater Invertebrates. Office of Research and Development. EPA/600/R-94/024.

Hart Crowser, 1999. Sediment Characterization Study of Local Sponsor's Berth; Columbia and Willamette River Navigation Channel Deepening; Longview and Kalama, Washington and Portland, Oregon. February 1, 1999.

Sincerely,

**HART CROWSER, INC.**

**HOWARD L. CUMBERLAND**

Associate Sediment Quality Specialist

**Table 1 - Proposed Sediment Sampling Locations, Depths, and Identification**  
**Port of Portland, Terminal 5, Berth 501/503**  
**Portland, Oregon**

Subsurface Core Location	Latitude	Longitude	Approximate Bathymetry in Feet (CRD)	Core Sample Bottom Elevation in Feet (CRD)	Core Depth in Feet	Composite Identification	DMMU Identification
Berth 501-Face HC-VC-B501-02	45° 38.547	122° 46.327	-40	-43	3	HC-B501-C1	T501-Face
HC-VC-B501-03	45° 38.528	122° 46.314	-40	-43	3		
Berth 501-Barge HC-VC-B501-01	45° 38.533	122° 46.254	-15	-18	3	--	T501-Barge
Berth 503 HC-VC-503-01	45° 38.290	122° 46.755	-40	-43	3	HC-B503-C1	T503
HC-VC-503-02	45° 38.278	122° 46.776	-40	-43	3		

**Notes:**

CRD = Columbia River Datum.

-- = Not Available.

**Table 2 - Sample Storage Criteria**  
**Port of Portland, Terminal 5, Berth 501/503**  
**Portland, Oregon**

Sample Type	Holding Time	Sample Size <sup>a</sup>	Temperature <sup>b</sup>	Container
Particle Size	6 Months	100-200g (150 ml)	4°C	1-liter Glass (combined)
Total Solids	14 Days	125g (100 ml)	4°C	
Total Volatile Solids	14 Days	125 g (100 ml)	4°C	
Total Organic Carbon	14 Days	125 g (100 ml)	4°C	
Ammonia	7 Days	25 g (20 ml)	4°C	
Metals (except Mercury)	6 Months	50 g (40 ml)	4°C	
Semivolatiles, Pesticides and PCBs	14 Days until extraction	150 g (120 ml)	4°C	
	1 Year until extraction		4°C	
	40 Days after extraction		4°C	
Tributyltin	14 Days until extraction	50 g (40 ml)		
Mercury	28 Days	5 g (4 ml)	4°C	
Total Sulfides	7 Days	.50g (40 ml)	4°C <sup>c</sup>	125 ml Plastic
Biological Testing	8 weeks	4 liters	4°C <sup>c</sup>	4-1 liter Glass
Archive	1 year	--	-20°C	250 ml Glass

- a. Recommended minimum field sample sizes for one laboratory analysis. Actual volumes to be collected have been increased to provide a margin of error and allow for retests.
- b. During transport to the lab, samples will be stored on blue ice. The mercury and archived samples will be frozen immediately upon receipt at the lab.
- c. The sulfides sample will be preserved with 5 ml of 2 Normal zinc acetate per 30 g of sediment.

**Table 3 - Analyte List and Targeted Detection Limits**

Analytes	Analytical Method	Reporting Limit <sup>a</sup>	LCRMA-SL
<b>CHEMICAL PARAMETERS SEDIMENTS</b>			
<b>Metals in mg/kg (ppm)</b>			
Antimony	U.S. EPA Method 6020	0.5	150
Arsenic	U.S. EPA Method 6020	0.5	57
Cadmium	U.S. EPA Method 6010A	0.5	5.1
Copper	U.S. EPA Method 6010A	0.5	390
Lead	U.S. EPA Method 6010A	0.5	450
Mercury	U.S. EPA Method 7471A	0.05	0.41
Nickel	U.S. EPA Method 6010A	0.5	140
Silver	U.S. EPA Method 6010A	0.5	6.1
Zinc	U.S. EPA Method 6010A	0.5	410
Tributyltin (as tin) in ug/L (ppb)	GC/FPD	0.025	0.15
<b>Phenol in ug/kg (ppb)</b>			
Phenol	GC/MS-SIM	13	420
2-Methylphenol	GC/MS-SIM	13	63
4-Methylphenol	GC/MS-SIM	13	670
2,4-Dimethylphenol	GC/MS-SIM	13	29
Pentachlorophenol	GC/MS-SIM	13	400
<b>LPAHs in ug/kg (ppb)</b>			
Naphthalene	GC/MS-SIM	6.7	2,100
2-Methylnaphthalene	GC/MS-SIM	6.7	670
Acenaphthylene	GC/MS-SIM	6.7	560
Acenaphthene	GC/MS-SIM	6.7	500
Fluorene	GC/MS-SIM	6.7	540
Phenanthrene	GC/MS-SIM	6.7	1,500
Anthracene	GC/MS-SIM	6.7	960
<b>HPAHs in ug/kg (ppb)</b>			
Fluoranthene	GC/MS-SIM	6.7	1,700
Pyrene	GC/MS-SIM	6.7	2,600
Benz(a)anthracene	GC/MS-SIM	6.7	1,300
Chrysene	GC/MS-SIM	6.7	1,400
Total benzofluoranthenes	GC/MS-SIM	13	3,200
Benzo(a)pyrene	GC/MS-SIM	6.7	1,600
Indeno(1,2,3-cd)pyrene	GC/MS-SIM	6.7	600
Dibenz(a,h)anthracene	GC/MS-SIM	6.7	230
Benzo(g,h,i)perylene	GC/MS-SIM	6.7	670
<b>Chlorinated Hydrocarbons in ug/kg</b>			
1,3-Dichlorobenzene	GC/MS-SIM	13	170
1,4-Dichlorobenzene	GC/MS-SIM	13	110
1,2-Dichlorobenzene	GC/MS-SIM	13	35
1,2,4-Trichlorobenzene	GC/MS-SIM	13	31
Hexachlorobenzene	GC/MS-SIM	13	22
<b>Phthalates in ug/kg (ppb)</b>			
Dimethyl phthalate	GC/MS-SIM	35	1,400
Diethyl phthalate	GC/MS-SIM	35	1,200
Di-n-butyl phthalate	GC/MS-SIM	35	5,100

**Table 3 - Analyte List and Targeted Detection Limits**

Analytes	Analytical Method	Reporting Limit <sup>a</sup>	LCRMA-SL
<b>CHEMICAL PARAMETERS SEDIMENTS</b>			
Butyl benzyl phthalate	GC/MS-SIM	35	970
Bis(2-ethylhexyl)phthalate	GC/MS-SIM	35	8,300
Di-n-octyl phthalate	GC/MS-SIM	35	6,200
<b>Misc. Extractables in ug/kg</b>			
Benzyl alcohol	GC/MS-SIM	50	57
Benzoic acid	GC/MS-SIM	50	650
Dibenzofuran	GC/MS-SIM	6.7	540
Hexachloroethane	GC/MS-SIM	13	1,400
Hexachlorobutadiene	GC/MS-SIM	13	29
N-Nitrosodiphenylamine	GC/MS-SIM	13	28
<b>Pesticides/PCBs in ug/kg (ppb)</b>			
Total PCBs	U.S. EPA Method 8080A	50	130
4,4'-DDE	U.S. EPA Method 8080A	5	NA
4,4'-DDD	U.S. EPA Method 8080A	5	NA
4,4'-DDT	U.S. EPA Method 8080A	5	6.9
Chlordane (alpha, gamma)	U.S. EPA Method 8080A	5	10
Aldrin	U.S. EPA Method 8080A	5	10
Dieldrin	U.S. EPA Method 8080A	5	10
Heptachlor	U.S. EPA Method 8080A	5	10
Lindane	U.S. EPA Method 8080A	5	10
<b>CONVENTIONAL PARAMETERS</b>			
Grain size	PSEP		
Percent solids	PSEP		
Total volatile solids	PSEP/EPA 160.4M	10 ppm	
Total organic carbon	PSEP/ASTM D4129-82M	50 ppm	
Total sulfides	PSEP	10-50 ppm	
Ammonia	U.S. EPA Method 350.1	1.0 ppm	

<sup>a</sup> Reporting Limit based on dry weight and assuming solids content greater than 50 percent.

The reporting limits shown are adequate for comparison with LCRM criteria.

\* Value is the MDL.

**able 4 - Minimum Laboratory QA/QC**  
**ort of Portland, Terminal 5, Berth 501/503**  
**ortland, Oregon**

Analysis Type	Method Blanks	Triplicates <sup>5</sup>	Replicates	Matrix Spike <sup>5</sup>	Surrogates <sup>1</sup>
Ammonia/Sulfides	X <sup>5</sup>	X			
Semivolatiles <sup>2,3</sup>	X <sup>4</sup>		X <sup>6,7</sup>	X	X
Pesticides/PCBs <sup>2,3</sup>	X <sup>4</sup>		X <sup>6,7</sup>	X	X
Metals	X <sup>5</sup>		X <sup>5</sup>	X	
Total Organic Carbon	X <sup>5</sup>	X			
Total Solids		X			
Total Volatile Solids		X			
Particle Size		X			

<sup>1</sup> Surrogate spikes required for every sample, including matrix spiked samples, blanks and reference materials.

<sup>2</sup> Initial calibration required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria.

<sup>3</sup> Ongoing calibration required at the beginning of each work shift, every 10-12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.

<sup>4</sup> Frequency of Analysis (FOA) = one per extraction batch

<sup>5</sup> FOA = 5% or one per batch, whichever is more frequent

<sup>6</sup> FOA = <20 samples: one per batch; 20+ samples: 1 triplicate and additional duplicates for a minimum of 5% total replication

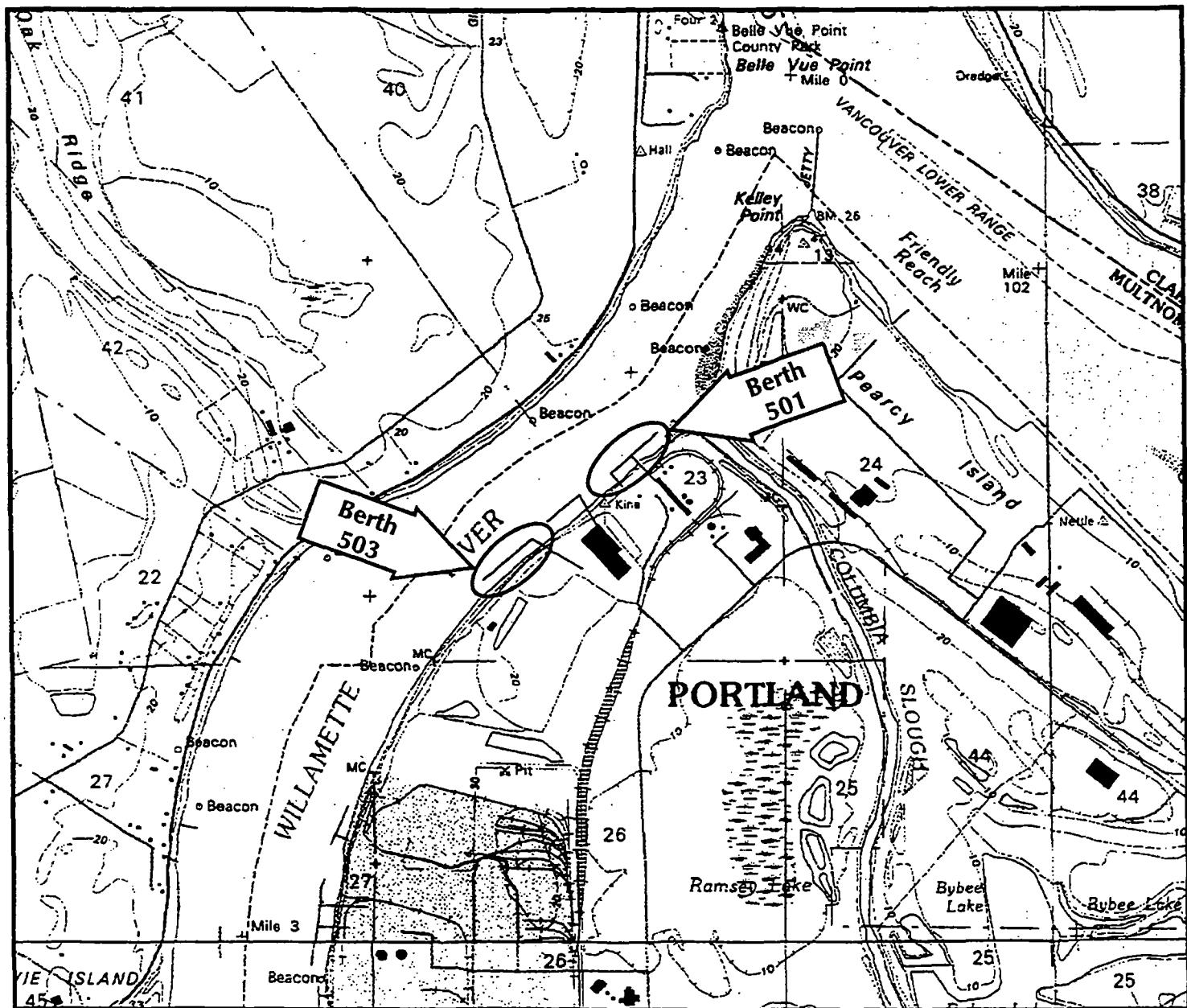
<sup>7</sup> Matrix spike duplicate will be run

**Table 5 - Sediment Biological Testing Performance and Decision Criteria**  
**Port of Portland, Terminal 5, Berth 501/503**  
**Portland, Oregon**

Biological Test	Reference Area/Control Performance Criteria <sup>1</sup>	Decision Criteria
Amphipod Acute Bioassay	Control sediment <20% mortality; Reference sediment <30% mortality	The test sediment has a higher (statistically significant, t test, $p<0.05$ ) mean mortality than the reference sediment and the test sediment mean mortality is greater than a value represented by the reference sediment mean mortality plus fifteen percent.
Midge Acute Bioassay	Control sediment <30% mortality, Reference sediment <35% mortality	The test sediment has a higher (statistically significant, t test, $p<0.05$ ) mean mortality than the reference sediment and the test sediment mean mortality is greater than a value represented by the reference sediment mean mortality plus twenty percent.
Midge Growth Bioassay	Control sediment <30% mortality, Growth performance standard of 0.6 g minimum weight per organism at test termination.	The test sediment has a mean reduction in biomass greater than forty percent of the reference sediment and the test sediment mean individual growth rate is statistically different (t test, $p<0.05$ ) from the reference sediment.

<sup>1</sup> The biological tests shall not be considered valid unless test results for the appropriate control and reference sediment samples meet the performance standard.

**Site Location Map**  
**Port of Portland**  
**Terminal 5 - Berth 501 and 503**



Note: Base map prepared from the USGS 7.5-minute quadrangles of Sauvie Island, Portland, Linton, Oregon, dated 1990 and Vancouver, Washington, dated 1990.

SCALE 1 : 24 000

1       $\frac{1}{2}$       0      1 MILE  
 1000      0      1000      2000      3000      4000      5000      6000      7000 FEET

CONTOUR INTERVAL 10 FEET

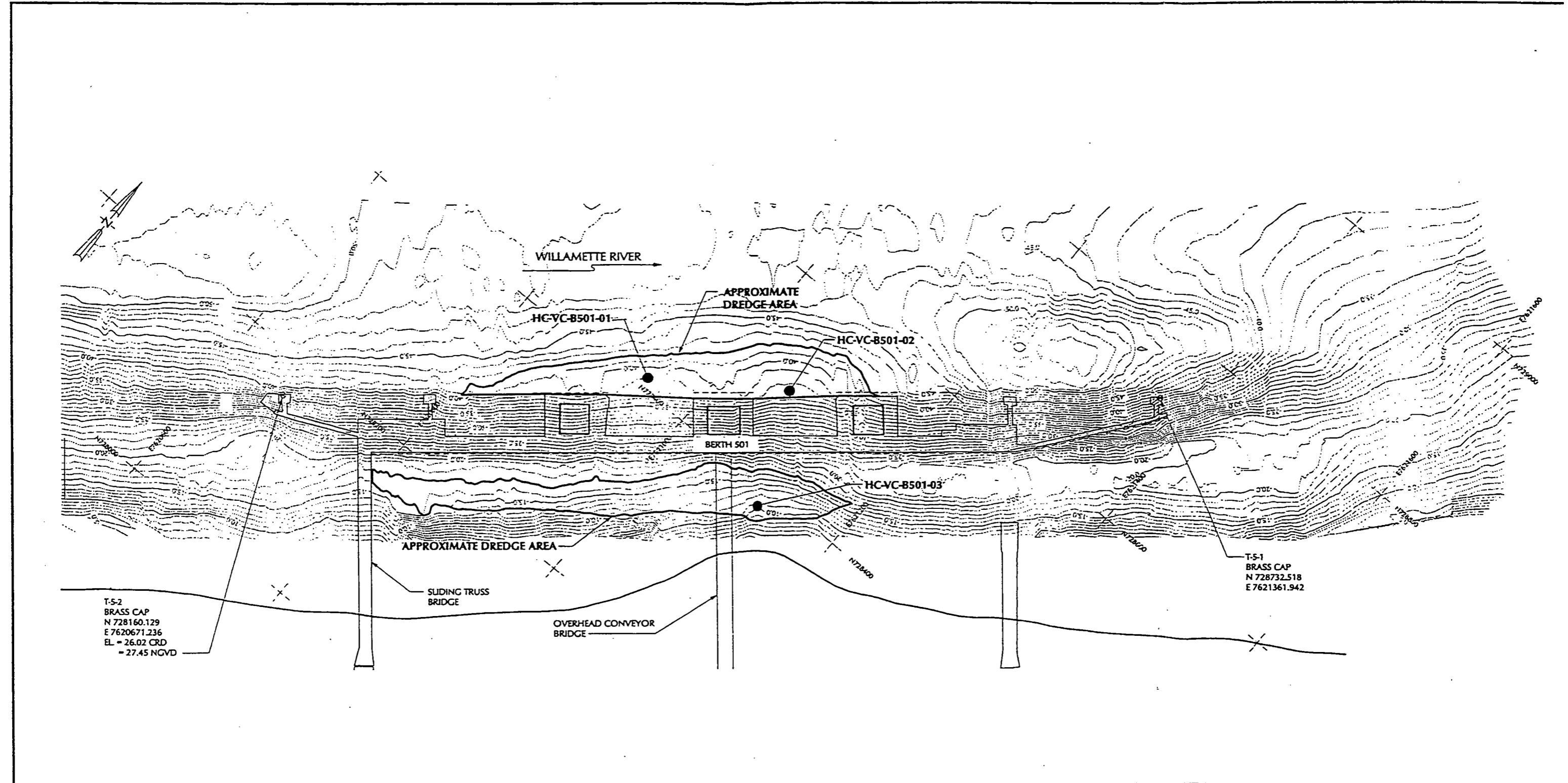
NATIONAL GEODETIC VERTICAL DATUM OF 1929



**HARTCROWSER**  
 J-5930  
 Figure 1  
 1/00

# Proposed Vibracore Sampling Locations at Berth 501 Berthing Areas

Port of Portland  
Terminal 5 - Berth 501



Note: Base map prepared from a plan provided by the Port of Portland.

## Legend:

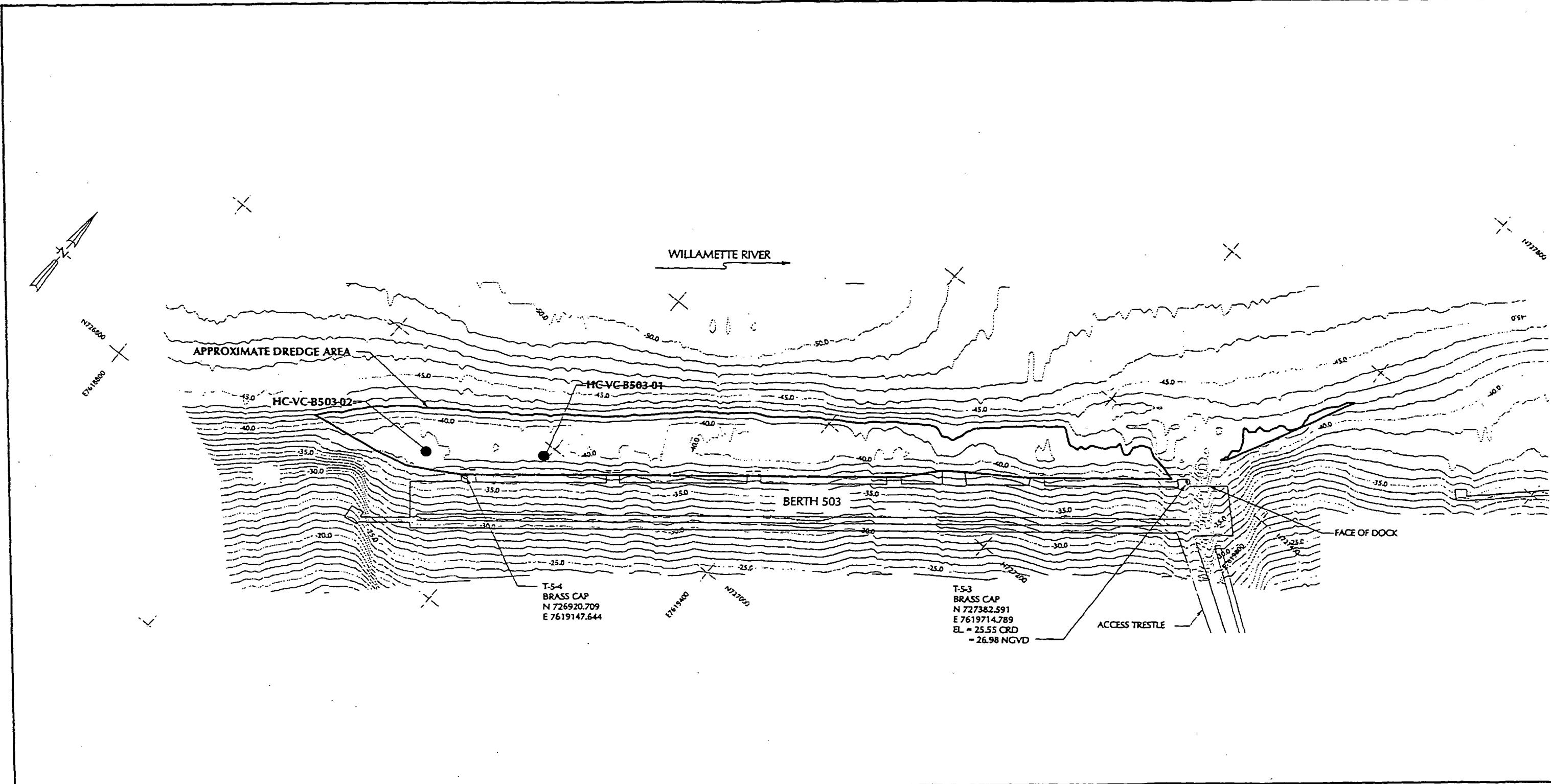
HC-VC-B501-03 ● Core Sample Location and Designation

0 100 200  
Approximate Scale in Feet

# Proposed Vibracore Sampling Locations at Berth 503 Berthing Area

Port of Portland

Terminal 5 - Berth 503



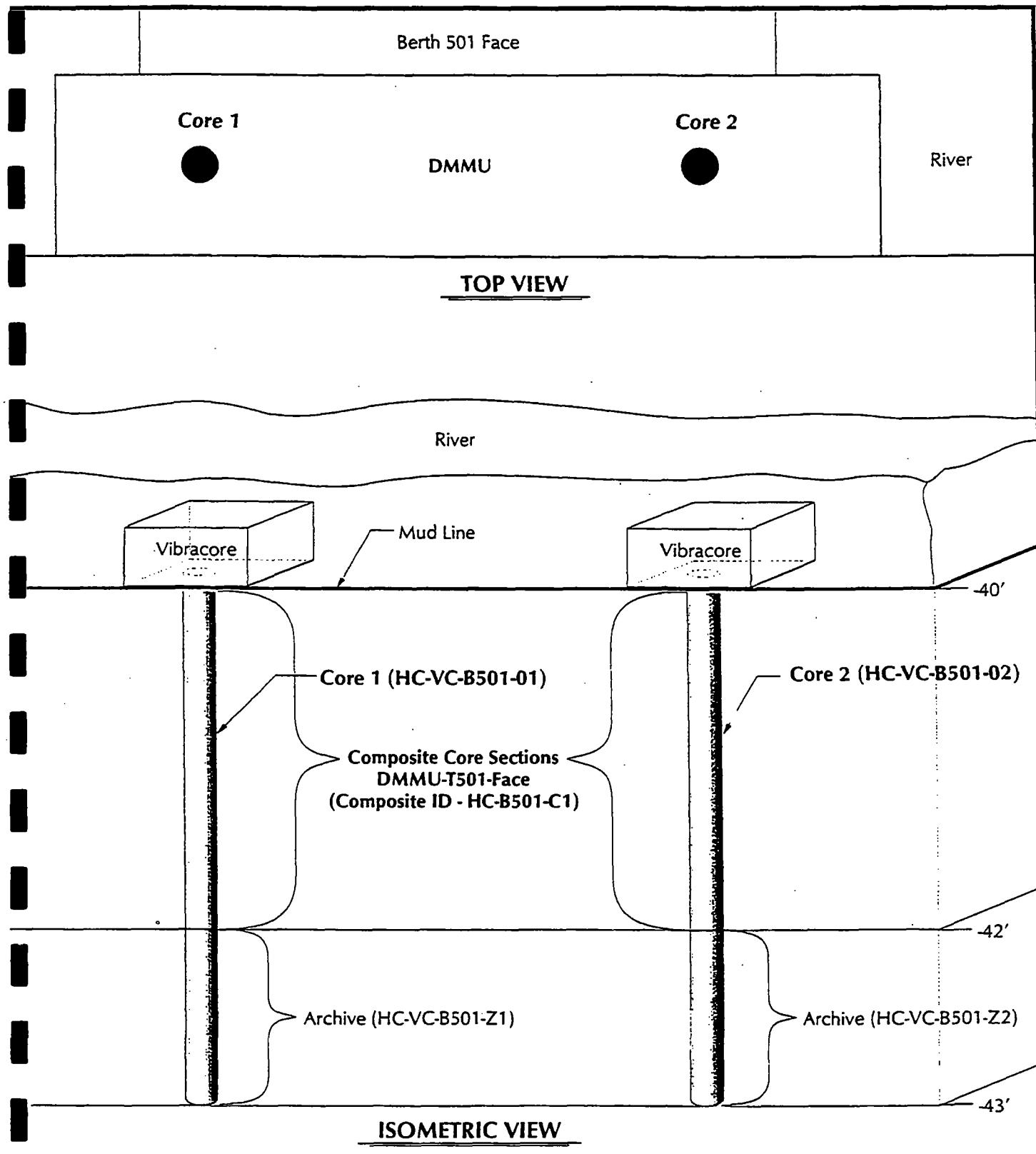
Note: Base map prepared from a plan provided by the Port of Portland.

## Legend:

HC-VC-B503-01 ● Core Sample Location and Designation

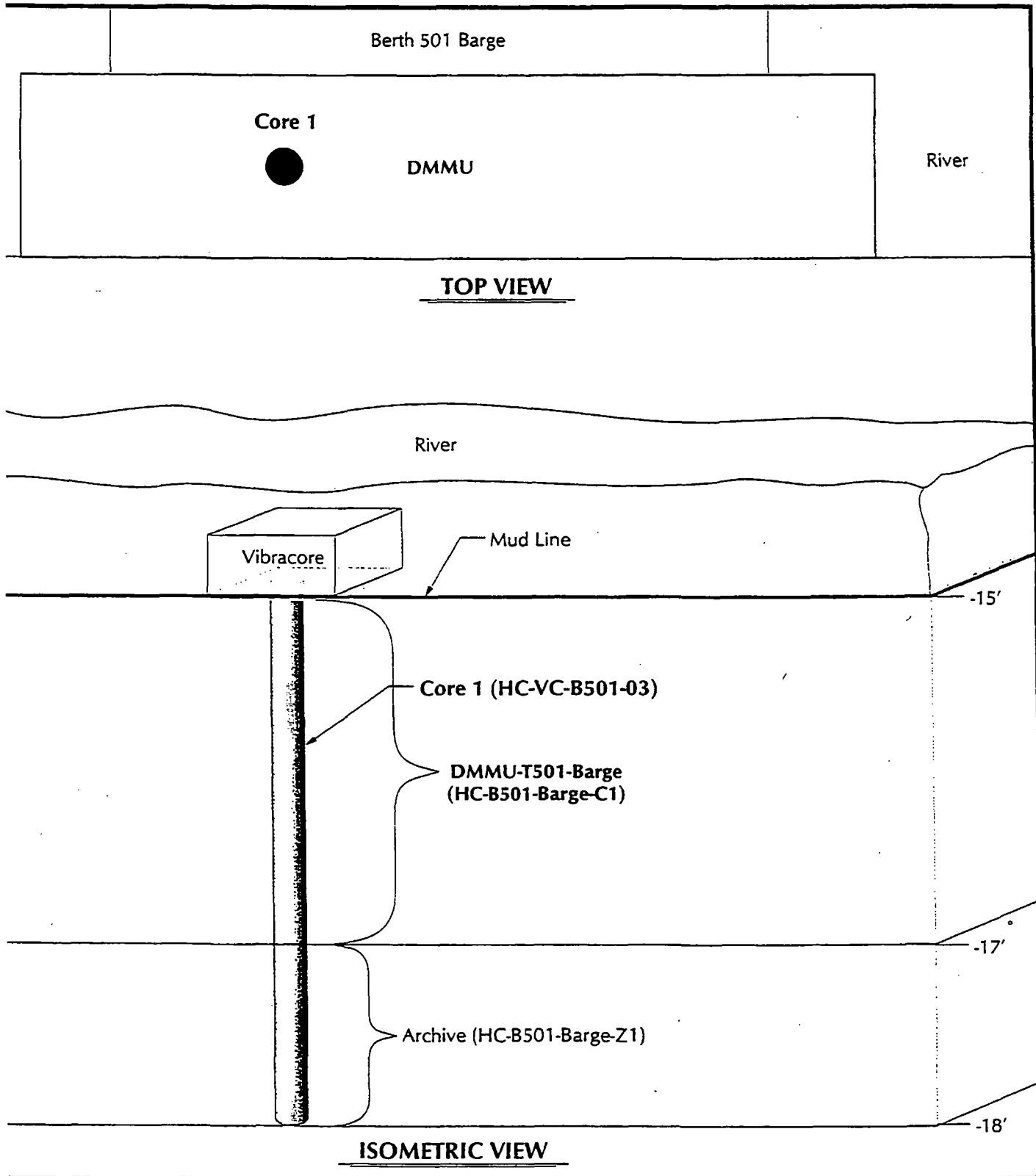
0 100 200  
Approximate Scale in Feet

# Vibracore Sampling Depths at Berth 501 - Face Berthing Area Port of Portland, Terminal 5 - Berth 501



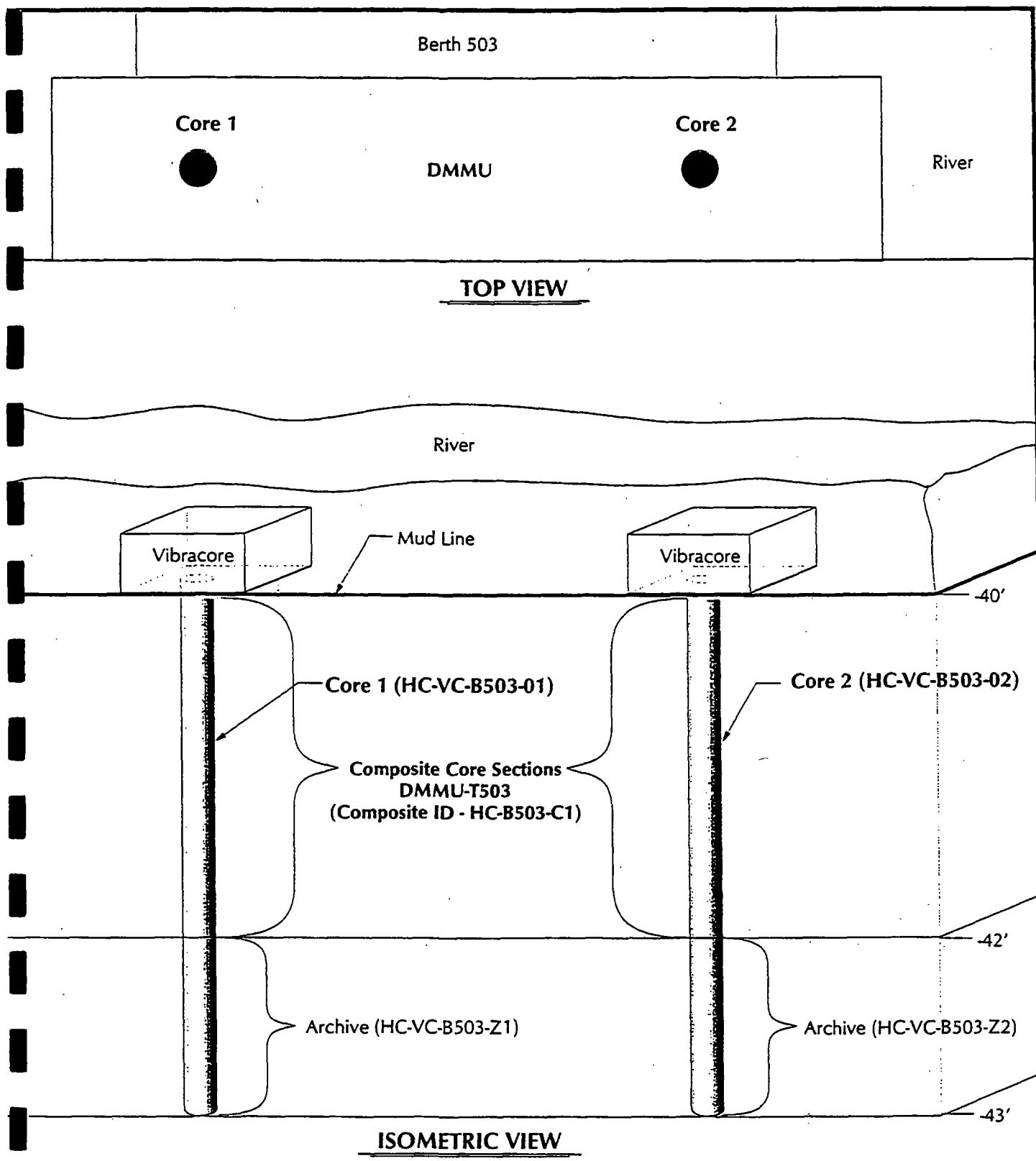
Not to Scale

# Vibracore Sampling Depth at Berth 501 - Barge Berthing Area of Portland, Terminal 5 - Berth 501



Not to Scale

# Vibracore Sampling Depths at Berth 503 Port of Portland, Terminal 5 - Berth 503



Not to Scale

## **Sediment Sampling Form**

Project \_\_\_\_\_

Date \_\_\_\_\_

Job No. \_\_\_\_\_

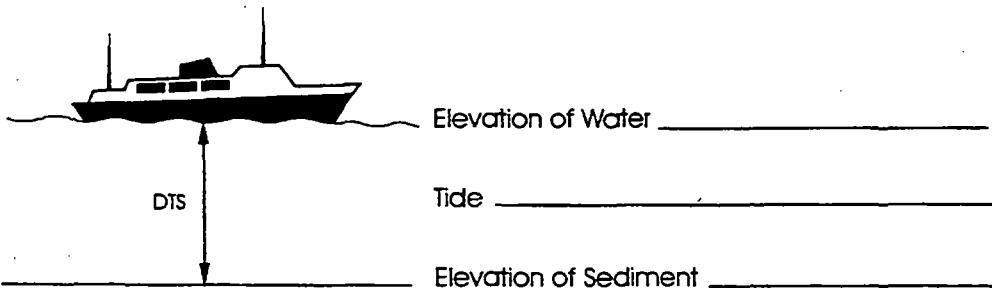
HC Reps \_\_\_\_\_

Sample Location \_\_\_\_\_

Sample Method \_\_\_\_\_

Proposed Coordinates N: \_\_\_\_\_

E: \_\_\_\_\_



#### SAMPLE ACCEPTABILITY CRITERIA:

- 1. Overlying water is present
  - 2. Water has low turbidity
  - 3. Sampler is not overfilled
  - 4. Surface is flat
  - 5. Desired penetration depth

Sediment Description \_\_\_\_\_

Sample Container Type \_\_\_\_\_

**Volume Filled** \_\_\_\_\_

Analysis

# Key to Sediment Logs

## Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing less presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:

Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

## Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.

Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SOIL or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 - 2	<0.125
Loose	4 - 10	Soft	2 - 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 - 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 - 15	0.5 - 1.0
Very dense	>50	Very stiff	15 - 30	1.0 - 2.0
		Hard	>30	>2.0

## Moisture

Little perceptible moisture
Damp Some perceptible moisture, probably below optimum
Wet Probably near optimum moisture content
Watery Much perceptible moisture, probably above optimum

## Minor Constituents

Estimated Percentage
Not identified in description
Slightly (clayey, silty, etc.)
Clayey, silty, sandy, gravelly
Very (clayey, silty, etc.)

## Legends

### Surface Sample Acceptability Criteria:

1. Overlying water is present
2. Water has low turbidity
3. Sampler is not overfilled
4. Surface is flat
5. Penetration depth is acceptable

### Estimated Percentage of other Minor Constituents

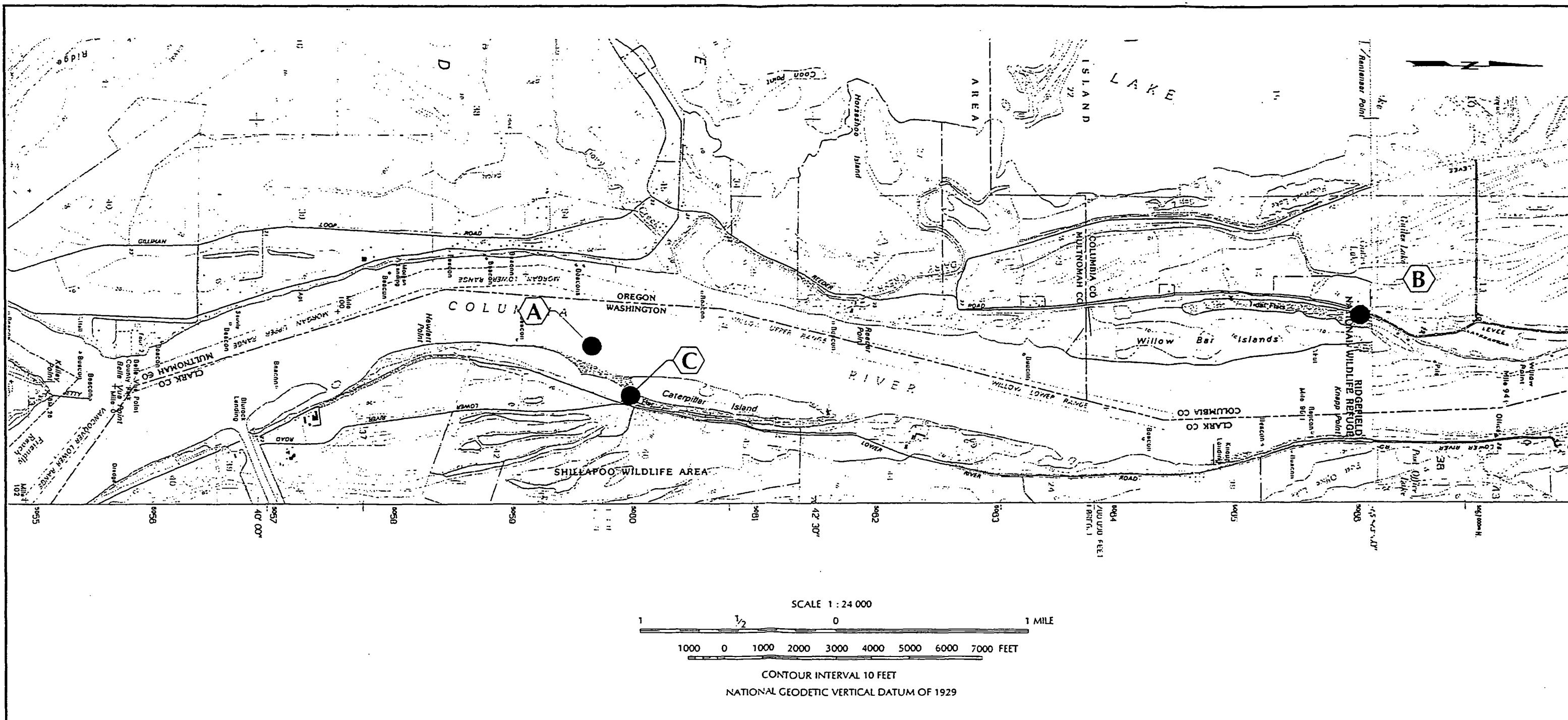
(ie. shells, wood, organics, plastic, metal brick, refuse)

Estimated Percentage
Dusting Trace on Surface
Trace 0-5
Moderate 5-20
Substantial 20-50

# Reference Sediment Sample Locations

Port of Portland

Terminal 5 - Berth 501 and 503



Note: Base map prepared from the USGS 7.5-minute quadrangle of Sauvie Island, Oregon, dated 1990.

Legend:

Reference Sediment Sample Location and Site Designation



**APPENDIX A**  
**HEALTH AND SAFETY PLAN**

**APPENDIX A**  
**HEALTH AND SAFETY PLAN**  
**TERMINAL 5 DREDGED MATERIAL ASSESSMENT**  
**DATE PREPARED: FEBRUARY 1, 2000**

**EMERGENCY CONTINGENCY INFORMATION**

SITE LOCATION	Port of Portland Marine Terminal 5 - Berth 501 Barge Dock and Face, Berth 503 on Willamette River Portland, Oregon
NEAREST HOSPITALS	Bess Kaiser Medical Center; Emergency Department 5055 N Greeley (503) 285-9321  The routes to the hospital are depicted on Figure A-1.
EMERGENCY RESPONDERS	Police Department.....911 Fire Department .....911 Ambulance.....911
EMERGENCY CONTACTS	Hart Crowser, Portland Office .....(503) 620-7284 Sebastian Degens, Port of Portland Facility Contact .....(503) 731-7214 Marine Security.....(503) 240-2230
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: 1 <b>Where You Are.</b> Address, cross streets, or landmarks 2 <b>Phone Number</b> you are calling from ?? <b>What Happened.</b> Type of injury, accident # <b>How many persons need help</b> ?? <b>What is being done for the victim(s)</b> !! <b>You hang up last.</b> Let whomever you called hang up first

## **SITE HEALTH AND SAFETY PLAN SUMMARY**

**SITE NAME:** Terminal 5, Berth 501 Barge Dock and Face and Berth 503

**LOCATION:** See Figure A-1

**CLIENT:** Port of Portland

**PROPOSED DATE OF ACTIVITY:** November 22, 1999

**TYPE OF FACILITY:** River Terminal

**LAND USE OF AREA SURROUNDING FACILITY:** Industrial

**SITE ACTIVITIES:** Collection of Sediment Cores

**POTENTIAL SITE CONTAMINANTS:** PAHs, Metals

**ROUTES OF ENTRY:** Airborne dust; skin contact with sediments and incidental ingestion of soil.

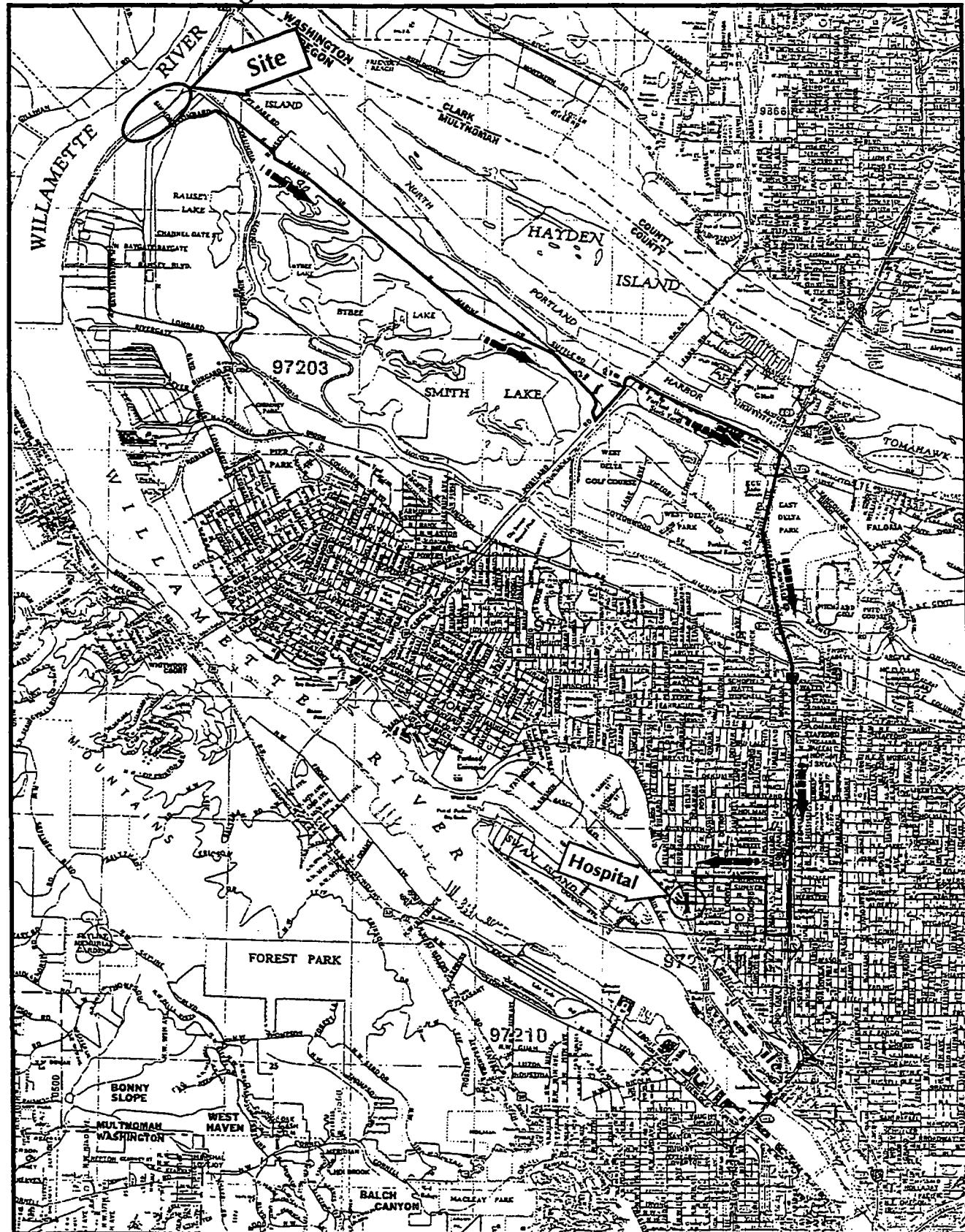
**PROTECTIVE MEASURES:** Engineering controls, safety glasses, safety boots, hardhat, gloves, protective clothing, and respirators.

**MONITORING EQUIPMENT:** None

# Route to Hospital Map

Port of Portland

Terminal 5 - Dredged Material Assessment



Note: Base map prepared from a Rand McNally, Portland, Oregon City Map.



**HARTCROWSER**  
J-5930 12/99  
Figure A-1

## **1.0 INTRODUCTION**

### ***1.1 Purpose and Regulatory Compliance***

This site-specific Health and Safety Plan (H&S Plan) addresses procedures to minimize the risk of chemical exposures, physical accidents to on-site workers, and environmental contamination. The H&S Plan covers each of the 11 required plan elements as specified in 29 CFR 1910.120 or equivalent state regulations. Table A-1 lists the sections of this plan, which apply to each of these required elements. When used together with the Hart Crowser General H&S Plan, this site-specific plan meets all applicable regulatory requirements.

**Table A-1 - Location of Required Health and Safety Plan Elements in This Site-Specific H&S Plan**

<b>Required H&amp;S Plan Element</b>	<b>Section in this Health and Safety Plan</b>
Confined space entry	2.6 Other Physical Hazards
Decontamination	7.0 Decontamination
Emergency response plan	11.0 Emergency Response Plan
Medical surveillance	12.0 Medical Surveillance
Monitoring program	2.3 Air Monitoring and Action Levels
Names of key personnel	1.3 Chain of Command
Personal protective equipment	3.0 Protective Equipment, 4.0 Safety Equipment List
Safety and hazard analysis	2.0 Hazard Evaluation and Control Measures
Site control	5.0 Exclusion Areas, 9.0 Site Security and Control
Spill containment	10.0 Spill Containment
Training	13.0 Training Requirements

### ***1.2 Distribution and Approval***

This H&S Plan will be made available to all Hart Crowser personnel involved in fieldwork on this project. It will also be made available to subcontractors and other non-employees who may need to work on the site. For non-employees, it must be made clear that the plan represents minimum safety procedures and that they are responsible for their own safety while present on site. The plan has been approved by the Hart Crowser Corporate Health and Safety (H&S) Manager. By signing the documentation form provided with this plan (Table A-3 located at the end of plan), project workers also certify their approval and agreement to comply with the plan.

### **1.3 Chain of Command**

The chain of command for health and safety on this project involves the following individuals:

#### **Project Manager—Howard L. Cumberland**

The Project Manager has overall responsibility for the successful outcome of the project. The Project Manager, in consultation with the Corporate H&S Manager, makes final decisions regarding questions concerning the implementation of the site-specific H&S Plan. The Project Manager may delegate this authority and responsibility to the Project and/or Field H&S Managers.

#### **Corporate H&S Manager—David E. Chawes, C.I.H.**

The Hart Crowser Corporate H&S Manager has overall responsibility for preparation and modification of this H&S Plan. In the event that health and safety issues arise during site operations, he will attempt to resolve them in discussion with the appropriate members of the project team.

#### **Project H&S Manager—Howard L. Cumberland**

The Project H&S Manager has overall responsibility for health and safety on this project. This individual ensures that everyone working on this project understands this H&S Plan. This individual will maintain liaison with the Hart Crowser Project Manager so that all relevant health and safety issues are communicated effectively to project workers.

#### **Field H&S Manager—Keith Kroeger**

The Field H&S Manager is responsible for implementing this H&S Plan in the field. This individual also observes subcontractors to verify that they are following these procedures, at a minimum. The Field H&S Manager will also assure that proper protective equipment is available and used in the correct manner, decontamination activities are carried out properly, and that employees have knowledge of the local emergency medical system should it be necessary.

### **1.4 Site Work Activities**

The following work task will be accomplished:

- Collection of sediment cores

## **1.5 Site Description**

The site is composed of a river freight terminal.

## **2.0 HAZARD EVALUATION AND CONTROL MEASURES**

### **2.1 Toxicity of Chemicals of Concern**

Based on previous site information and knowledge of the types of activities conducted at this location, the following chemicals may be present at this site: PAHs, metals.

Health hazards of these chemicals are discussed below. This information covers potential toxic effects, which might occur if relatively significant acute and/or chronic exposure were to happen. This information does not mean that such effects will occur from the planned site activities. In general, the chemicals, which may be encountered at this site, are not expected to be present at concentrations that could produce significant exposures. The types of planned work activities and use of monitoring procedures and protective measures will limit potential exposures at this site.

These standards are presented using the following abbreviations:

PEL Permissible exposure limit.

TWA Time-weighted average exposure limit for any 8-hour work shift.

STEL Short-term exposure limit expressed as a 15-minute time-weighted average and not to be exceeded at any time during a work day.

#### **Polycyclic Aromatic Hydrocarbons (PAHs)**

Exposure to PAHs can occur via inhalation of vapors, ingestion, and skin and eye contact. Skin contact can result in reddening or corrosion. Ingestion can cause nausea, vomiting, blood pressure fall, abdominal pain, convulsions, and coma. Damage to the central nervous system can also occur. The U.S. Department of Health and Human Services (1989) has classified 15 PAHs compounds as having sufficient evidence for carcinogenicity, while the U.S. EPA (1990) has classified at least five of the identified PAHs as human carcinogens. There is no currently assigned PEL-TWA for PAHs, but the closely related material coal tar is listed as coal tar pitch volatiles with a PEL-TWA of 0.2 mg/m<sup>3</sup>.

### Arsenic

Arsenic is toxic by inhalation and ingestion of dusts and fumes or by inhalation of arsine gas. Trivalent arsenic compounds are the most toxic to humans, with significant corrosive effects on the skin, eyes, and mucous membranes. Dermatitis also frequently occurs, and skin sensitization and contact dermatitis may result from arsenic trioxide or pentoxide. Trivalent arsenic interacts with a number of sulphhydryl proteins and enzymes, altering their normal biological function. Ingestion of arsenic can result in fever, anorexia, cardiac abnormalities, and neurological damage. Liver injury can accompany chronic exposure. Skin and inhalation exposure to arsenic has been associated with cancer in humans, particularly among workers in the arsenical-pesticide industry or copper smelters. The EPA currently classifies arsenic as a Class A, or confirmed, human carcinogen. Arsine is a highly toxic gaseous arsenical, causing nausea, vomiting, and hemolysis. The current PEL-TWA for organic and inorganic forms of arsenic is 0.01 mg/m<sup>3</sup>.

### Nickel

Nickel exposure can occur via inhalation of dust or fume, ingestion, and eye and skin contact. Nickel and its compounds are irritating to the eye and mucous membranes, and skin exposure frequently leads to sensitization and a chronic eczema referred to as "nickel itch." Elemental nickel and nickel salts are considered probable carcinogens via inhalation, and nickel carbonyl is clearly recognized as a human carcinogen. Animal studies have demonstrated health effects on the kidneys, liver, brain, and heart muscle. The current PEL-TWA for soluble nickel and insoluble nickel are 0.1 and 1.0 mg/m<sup>3</sup>, respectively. The PEL-TWA for nickel carbonyl is 0.007 mg/m<sup>3</sup> as nickel.

### Lead

**Inorganic Lead.** Inorganic lead exposure can occur via inhalation of dusts or metal fumes, ingestion of dusts, and skin and eye contact. The principal target organs of lead toxicity include the nervous system, kidneys, blood, gastrointestinal, and reproductive systems. Generalized symptoms of lead exposure include decreased physical fitness, fatigue, sleep disturbances, headaches, bone and muscle pain, constipation, abdominal pain, and decreased appetite. More severe exposure can result in anemia, severe gastrointestinal disturbance, a "lead-line" on the gums, neurological symptoms, convulsions, and death.

Neurological effects are among the most severe of inorganic lead's toxic effects and vary depending on the age of individual exposed. Effects observed in adults

occur primarily in the peripheral nervous system, resulting in nerve destruction and degeneration. Wrist-drop and foot-drop are two characteristic manifestations of this toxicity.

The EPA also currently lists inorganic lead as a Group B2 probable human carcinogen via the oral route. This conclusion is based on feeding studies conducted in laboratory animals. The current PEL-TWA for inorganic lead is 0.05 mg/m<sup>3</sup>. Occupational exposure to lead is also specifically regulated under WAC 296-62-07521, with an action level established at 0.03 mg/m<sup>3</sup> that triggers monitoring and other requirements.

**Organic-Lead Compounds.** The most notable organo-lead compounds are tetraethyl (TEL) and tetraethyl lead (TML). These chemicals are colorless liquids, which have been used principally as anti-knock compounds in gasoline. When used as such, they are generally mixed with soluble dyes for identification purposes. In the environment, TEL is reported to decompose under sunlight to form crystals of mono-, di-, and triethyl lead compounds, which have a characteristic garlic-like odor.

TEL and TML can be toxic via inhalation, ingestion, percutaneous absorption, and skin and eye contact. Major target organs include the kidneys and the nervous, gastrointestinal, and cardiovascular systems. TEL is irritating to the eyes, and its decomposition products may be inhaled as dust, leading to irritation of the upper respiratory tract and convulsive sneezing. The dusts may also cause itching, burning, and redness of eyes and mucous membranes.

TEL and TML are also readily absorbed into the nervous system and are considerably more neurotoxic than inorganic lead. Minor intoxication by TEL or TML can result in nervous excitation, insomnia, and gastrointestinal symptoms. The most notable symptom of TEL poisoning and repeated exposure is encephalopathy (disease of the brain), characterized by symptoms of anxiety, delirium with hallucinations, delusions, convulsions, and acute psychosis. In contrast to inorganic lead intoxication, peripheral nerve damage is not observed. The current PEL-TWA for both TEL and TML is 0.075 mg/m<sup>3</sup> as lead.

### Zinc

Zinc compounds can be hazardous by inhalation of dust and fumes, ingestion, and skin and eye contact. Zinc chloride is corrosive to skin and mucous membranes, and sensitization can occur resulting in dermatitis. Eye contact can produce inflammation and corneal ulceration. Ingestion can result in corrosive damage to the digestive tract. The current PEL-TWA for exposure to zinc chloride fume is 1 mg/m<sup>3</sup>. Zinc chromate exhibits potential carcinogenic effects

and is currently limited with a PEL-TWA of 0.05 mg/m<sup>3</sup>. Zinc oxide is toxic via inhalation of fumes and dusts and may cause dermatitis. The current PEL-TWA for zinc oxide is 10 mg/m<sup>3</sup> as total dust and 5 mg/m<sup>3</sup> as the respirable fraction.

## **2.2 Potential Exposure Routes**

### **Inhalation**

Exposure via this route could occur if dusts become airborne during site activities. This is unlikely given the wet nature of the sediment cores.

### **Skin Contact**

Exposure via this route could occur if contaminated sediments contact the skin or clothing. Protective clothing and decontamination activities specified in this plan will minimize the potential for skin contact with the contaminants.

### **Ingestion**

Exposure via this route could occur if individuals eat, drink or perform other hand-to-mouth contact in the contaminated (exclusion) zones.

Decontamination procedures established in this plan will minimize the inadvertent ingestion of contaminants.

## **2.3 Air Monitoring and Action Levels**

Air monitoring will not be conducted based on the low potential for airborne dusts.

## **2.4 Fire and Explosion Hazard**

Potentially explosive conditions are unlikely to be encountered. Field monitoring equipment will not be necessary to determine the percent of the lower explosive limit (LEL).

An ABC dry chemical fire extinguisher with a minimum charge of 10 pounds shall be a part of the sampling equipment brought to the site. Observe basic precautions such as no smoking or creation of sparks or open flames.

## **2.5 Cold Stress**

Cold stress, or hypothermia, can result from abnormal cooling of the core body temperature.

### Signs of Hypothermia

Hypothermia can result from abnormal cooling of the core body temperature. It is caused by exposure to a cold environment, and wind-chill as well as wetness or water immersion can play a significant role. The following discusses signs and symptoms as well as treatment for hypothermia.

Typical warning signs of hypothermia include fatigue, weakness, incoordination, apathy, and drowsiness. A confused state is a key symptom of hypothermia. Shivering and pallor are usually absent, and the face may appear puffy and pink. Body temperatures below 90° F require immediate treatment to restore temperature to normal.

### Treatment of Hypothermia

Current medical practice recommends slow rewarming as treatment for hypothermia, followed by professional medical care. This can be accomplished by moving the person into a sheltered area and wrapping with blankets in a warm room. In emergency situations where body temperature falls below 90° F and heated shelter is not available, use a sleeping bag, blankets and/or body heat from another individual to help restore normal body temperature.

## **2.6 Other Physical Hazards**

### Trips/Falls

As with all fieldwork sites, caution will be exercised to prevent slips on rain slick surfaces, stepping on sharp objects, etc. Care will be taken not to fall off the boat.

### Noise

Appropriate hearing protection (ear muffs or ear plugs with a noise reduction rating of at least 25 dB) will be used for individuals working near an active drill rig or other high-noise generating equipment.

## **2.7 Hazard Analysis and Applicable Safety Procedures by Task**

The work tasks and associated hazards, which may be anticipated during the operations described elsewhere in this work plan, and suitable control measures are presented in Table A-2.

**Table A-2 - Hazard Analysis by Task**

Work Task	Hazards	Protective Measures
Site reconnaissance	None anticipated	Level D PPE
Sample collection	Splashes, skin contact, inhalation	Level D PPE

**Sediment Sampling**

All sampling activities will be conducted under the assumption that the media is contaminated and appropriate personnel protection will be required.

### **3.0 PROTECTIVE EQUIPMENT**

Workers performing general site activities where skin contact with free product or contaminated materials is not likely and inhalation risks are not expected will wear regular work clothes or rain suit, eye protection, hardhat, nitrile or neoprene-coated work gloves (as required), and safety boots.

### **4.0 SAFETY EQUIPMENT LIST**

The following Safety Equipment must be available on site:

- Fire Extinguisher - 10 lb ABC;
- First Aid Kit;
- Eye Wash Kit;
- Mobile Telephone;
- Hard Hat;
- PVC (or similar) rainsuit;
- Neoprene Steel-Toed Boots; and
- Neoprene Outer Gloves/Nitrile or Latex Inner Gloves

### **5.0 EXCLUSION AREAS**

If migration of chemicals from the work area is a possibility, or as otherwise required by regulations or client specifications, site control will be maintained by establishing clearly identified work zones. These will include the exclusion zone, contaminant reduction zone, and support zone, as discussed below.

### **5.1 Exclusion Zone**

Exclusion zones will be established around the sample collection work area on the boat. Only persons with appropriate training and authorization from the Field H&S Manager will enter this area while work is being conducted there.

### **5.2 Contamination Reduction Zone**

A contamination reduction zone will be established just outside the temporary exclusion zone to decontaminate equipment and personnel as discussed below. This zone will be clearly delineated from the exclusion zone and support zone. Care will be taken to prevent the spread of contamination from this area.

### **5.3 Support Zone**

A support zone will be established outside the contamination reduction area to stage clean equipment, don protective clothing, take rest breaks, etc. This zone will be clearly delineated from the contaminant reduction zone using the means noted above.

## **6.0 MINIMIZATION OF CONTAMINATION**

To make the work zone procedure function effectively, the amount of equipment and number of personnel allowed in contaminated areas must be minimized. In addition, the amounts of soil, water, or other media collected should not exceed what is needed for laboratory analysis and record samples. Do not kneel on contaminated ground, stir up unnecessary dust, or perform any practice that increases the probability of hand-to-mouth transfer of contaminated materials. Use plastic drop cloths and equipment covers where appropriate. Eating, drinking, chewing gum, smoking, or using smokeless tobacco is forbidden in the exclusion zone.

## **7.0 DECONTAMINATION**

Decontamination is necessary to limit the migration of contaminants from the work zone(s) onto the site or from the site into the surrounding environment. Equipment and personnel decontamination are discussed in the following sections, and the following types of equipment will be available to perform these activities:

- Boot and Glove Wash Bucket and Rinse Bucket
- Scrub Brushes - Long Handled

- Spray Rinse Applicator
- Plastic Garbage Bags
- 5-Gallon Container Alkaline Decon Solution

## ***7.1 Equipment Decontamination***

Proper decontamination (decon) procedures will be employed to ensure that contaminated materials do not contact individuals and are not spread from the site. These procedures will also ensure that contaminated materials generated during site operations and during decontamination are managed appropriately.

All non-disposable equipment will be decontaminated in the contamination reduction zone. Prior to demobilization, all contaminated portions of heavy equipment should be thoroughly cleaned. Heavy equipment may require steam cleaning. Soil and water sampling instruments should be cleaned with detergent solutions in portable buckets.

## ***7.2 Personnel Decontamination***

Personnel working in exclusion zones will perform decontamination in the contamination reduction zone prior to taking rest breaks, drinking liquids, etc. The following describes the procedures for decon activities.

### **Mini-Decon Procedure:**

1. In the contamination reduction zone, wash and rinse gloves and boots in portable buckets.
2. Remove protective suit.
3. Remove work boot and gloves. Inspect and discard if ripped or damaged.
4. Remove respirator (if worn) and clean off sweat and dirt using premoistened towelettes. Deposit used cartridges in plastic bag.

### **Full-Decon Procedure:**

1. In the contamination reduction zone, wash and rinse outer gloves and boots in portable buckets.
2. Remove outer gloves and protective suit and deposit in labeled container for disposable clothing.
3. Remove respirator, and place used respirator cartridges (if end of day) in container for disposable clothing.
4. If end of day, thoroughly clean respirator and store properly.

5. Remove inner gloves and discard into labeled container for disposable clothing.
6. Remove work boots without touching exposed surfaces, and put on street shoes. Put boots in individual plastic bag for later reuse.
7. Immediately wash hands and face using clean water and soap.
8. Shower as soon after work shift as possible.

## **8.0 DISPOSAL OF CONTAMINATED MATERIALS**

All disposable sampling equipment and materials will be placed inside of a 6-mil polyethylene bag or other appropriate container. Disposable supplies will be removed from the site with the personnel.

## **9.0 SITE SECURITY AND CONTROL**

Site security and control will be the responsibility of the Project Manager. The "buddy-system" will be used when working in designated hazardous areas. Any security or control problems will be reported to appropriate authorities.

## **10.0 SPILL CONTAINMENT**

Sources of bulk chemicals subject to spillage are not expected to be encountered in this project. Accordingly, spill containment plan is not required for this project.

## **11.0 EMERGENCY RESPONSE PLAN**

The Hart Crowser Emergency Response Plan outlines the steps necessary for appropriate response to emergency situations. The following paragraphs summarize the key Emergency Response Plan procedures for this project.

### ***11.1 Plan Content and Review***

The principal hazards addressed by the Emergency Response Plan include the following: fire or explosion, medical emergencies, uncontrolled contaminant release, and situations such as the presence of chemicals above exposure guidelines or inadequate protective equipment for the hazards present. However, in order to help anticipate potential emergency situations, field

personnel shall always exercise caution and look for signs of potentially hazardous situations, including the following as examples:

- Visible or odorous chemical contaminants;
- Drums or other containers;
- General physical hazards, slippery or uneven surfaces, etc.;
- Live electrical wires or equipment; and
- Underwater pipelines or cables.

These and other potential problems should be anticipated and steps taken to avert problems before they occur.

The Emergency Response Plan shall be reviewed and rehearsed, as necessary, during the on-site health and safety briefing. This ensures that all personnel will know what their duties shall be if an actual emergency occurs.

## **11.2 Plan Implementation**

The Field H&S Manager shall act as the lead individual in the event of an emergency situation and evaluate the situation. He will determine the need to implement the emergency procedures, in concert with other resource personnel including client representatives, the Project Manager, and the Corporate H&S Manager. Other on-site field personnel will assist the Field H&S Manager as required during the emergency.

In the event that the Emergency Response Plan is implemented, the Field H&S Manager or designee is responsible for alerting all personnel at the affected area by use of a signal device (such as a hand-held air horn) or visual or shouted instructions, as appropriate.

Emergency evacuation routes and safe assembly areas shall be identified and discussed in the on-site health and safety briefing, as appropriate. The buddy-system will be employed during evacuation to ensure safe escape, and the Field H&S Manager shall be responsible for roll call to account for all personnel.

## **11.3 Emergency Response Contacts**

Site personnel must know whom to notify in the event of Emergency Response Plan implementation. The following information will be readily available at the site in a location known to all workers:

- Emergency Telephone Numbers: see list at the beginning of this plan;
- Route to Nearest Hospital: see list and route maps (Figure A-1) at the beginning of this plan;
- Site Descriptions: see the description at the beginning of this plan; and
- If a significant environmental release of contaminants occurs, the federal, state, and local agencies noted in this plan must be immediately notified. If the release to the environment includes navigable waters also notify:

National Response Center at (800) 424-8802  
EPA at (908) 321-6660

In the event of an emergency situation requiring implementation of the Emergency Response Plan (fire or explosion, serious injury, tank leak or other material spill, presence of chemicals above exposure guidelines, inadequate personnel protection equipment for the hazards present, etc.), cease all work immediately. Offer whatever assistance is required, but do not enter work areas without proper protective equipment. Workers not needed for immediate assistance will decontaminate per normal procedures (if possible) and leave the work area, pending approval by the Field H&S Manager for restart of work. The following general emergency response safety procedures should be followed.

#### **11.4 Fires**

Hart Crowser personnel will attempt to control only very small fires. If an explosion appears likely, evacuate the area immediately. If a fire occurs which cannot be controlled with the 10-pound ABC fire extinguisher located in the field equipment, then immediate intervention by the local fire department or other appropriate agency is imperative. Use these steps:

- Evacuate the area to a previously agreed upon, upwind location;
- Contact fire agency identified in the site specific plan; and
- Inform Project Manager or Field H&S Manager of the situation.

#### **11.5 Medical Emergencies**

Contact the agency listed in the site-specific plan if a medical emergency occurs. If a worker leaves the site to seek medical attention, another worker should accompany the patient. When in doubt about the severity of an accident or exposure, always seek medical attention as a conservative approach. Notify the

Project Manager of the outcome of the medical evaluation as soon as possible. For minor cuts and bruises, an on-site first aid kit will be available.

- If a worker is seriously injured or becomes ill or unconscious, immediately request assistance from the emergency contact sources noted in the site-specific plan. Do not attempt to assist an unconscious worker in an untested or known dangerous confined space without applying confined space entry procedures.

## **11.6 Uncontrolled Contaminant Release**

In the event of a hazardous material spill, attempt to stop and contain the flow of material using absorbents, booms, dirt, or other appropriate material. Prevent migration of liquids into streams or other bodies of water by building trenches, dikes, etc. Drum the material for proper disposal or contact a spill removal firm for material cleanup and disposal, as required. Observe all fire and explosion precautions while dealing with spills.

## **11.7 Potentially High Chemical Exposure Situations/Inadequate Protective Equipment**

In some emergency situations, workers may encounter localized work areas where exposure to previously unidentified chemicals could occur. A similar hazard includes situations where chemicals are present above permissible exposure levels and/or above the levels suitable for the personnel protective equipment at hand on-site. If these situations occur, immediately stop work and evacuate the work area. Do not reenter the area until appropriate help is available and/or appropriate personnel protective equipment is obtained. Do not attempt to rescue a downed worker from such areas without employing confined space entry procedures. Professional emergency response assistance (fire department, HAZMAT team, etc.) may be necessary to deal with this type of situation.

## **11.8 Other Emergencies**

Depending on the type of project, other emergency scenarios may be important at a specific work site. These scenarios will be considered as part of the site-specific plan and will be discussed during the on-site safety briefing, as required.

## **11.9 Plan Documentation and Review**

The Field H&S Manager will notify the Project H&S Manager as soon as possible after the emergency situation has been stabilized. The Project Manager or H&S

Manager will notify the appropriate client contacts, and regulatory agencies, if applicable. If an individual is injured, the Field H&S Manager or designate will file a detailed Accident Report with the Corporate H&S Manager within 24 hours.

The Project Manager and the Field, Project, and Corporate H&S Managers will critique the emergency response action following the event. The results of the critique will be used in follow-up training exercises to improve the Emergency Response Plan.

## **12.0 MEDICAL SURVEILLANCE**

A medical surveillance program has been instituted for Hart Crowser employees having exposure to hazardous substances. Exams are given before assignment, annually thereafter, and upon termination. Content of exams is determined by the Occupational Medicine physician in compliance with applicable regulations and is detailed in the General H&S Plan.

Each team member will have undergone a physical examination as noted above in order to verify that he/she is physically able to use protective equipment, work in hot environments, and not be predisposed to occupationally induced disease. Additional exams may be needed to evaluate specific exposures or unexplainable illness.

## **13.0 TRAINING REQUIREMENTS**

Hart Crowser employees who perform site work must understand potential health and safety hazards. All employees potentially exposed to hazardous substances, health hazards, or safety hazards will have completed 40 hours of off-site initial hazardous materials health and safety training or will possess equivalent training by past experience. They will also have a minimum of three days of actual field experience under the direct supervision of a trained supervisor. All employees will have in their possession evidence of completing this training. Employees will also complete annual refresher, supervisor, and other training as required by applicable regulations.

At the start of the workday, the Field H&S Manager will review applicable health and safety issues with all employees and subcontractors working on the site, as appropriate. This briefing will also review the work to be accomplished, with an opportunity for questions to be asked.

**Table A-3 - Record of Health and Safety Communication**

**PROJECT MANAGER: PLEASE ROUTE A COPY OF THIS FORM TO THE CORPORATE H&S MANAGER WHEN COMPLETED.**



***Sediment Characterization Study  
Terminal 5, Berths 501 & 503  
Port of Portland***

***Prepared for  
Port of Portland***

***March 9, 2000  
J-5930***

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**SEDIMENT CHARACTERIZATION STUDY  
TERMINAL 5, BERTHS 501 AND 503  
WILLAMETTE RIVER  
PORTLAND, OREGON**

## **1.0 INTRODUCTION**

### ***1.1 Project Description***

The Port of Portland (Port) proposes to conduct maintenance dredging at three berthing areas at Terminal 5 in order to remove sediment that has accumulated above navigational depths. These berths (Berth 501-Face, Berth 501-Barge, and Berth 503) are located on the Willamette River (Figure 1). For sampling and testing purposes, these berthing areas were separated into three Dredge Material Management Units (DMMUs) and designated as DMMU B501-Face, DMMU B501-Barge, and DMMU B503.

Maintenance dredging is proposed at DMMU B501-Face to maintain a depth of -40 feet Columbia River Datum (CRD) (plus two feet of overdredge) and would remove approximately 697 cubic yards of material (Figure 2). Maintenance dredging is proposed for the DMMU B501-Barge berthing area to maintain a depth of -15 feet CRD (plus two feet of overdredge) and would remove approximately 1,125 cubic yards of material (Figure 2). At DMMU B503, maintenance dredging is proposed to maintain berthing depths of -40 feet CRD (plus two feet of overdredge) and would remove approximately 2,109 cubic yards of material (Figure 3).

This dredge material characterization project was conducted using the tiered testing approach in accordance with the Dredge Material Evaluation Framework for the Lower Columbia River Management Area (LCRMA) (Corps et al., 1998). Results will be used to determine whether the proposed dredge material is suitable for unconfined, open-water disposal at Morgan Bar (Columbia River at Mile 100 - 101). This work was conducted for the Port of Portland under Purchase Order No. S1615, Project No. 52255, Task No. 900.

Dredging at each berth is currently scheduled to occur during the year 2000 dredging season. However, under the testing guidelines of the LCRMA, the data from this study would be valid for at least five years (Corps et al., 1998).

## **1.2 Results of Previous Sediment Sampling**

**Berth 501-Face.** In 1998, the Port completed a Tier II sediment quality characterization study at the face of Berth 501. The only chemical detected above its corresponding LCRMA screening level (LCRMA-SL) was total DDT. Total DDT was detected at 14.9 µg/kg, which slightly exceeded the LCRMA-SL of 6.9 µg/kg. Based on the exceedence of the LCRMA-SL for total DDT and consultation with the U.S. Army Corps of Engineers (Corps), it was determined that further evaluation using Tier III bioassay testing would be required to determine if unconfined, open-water disposal is an appropriate option for the proposed dredge sediments (Hart Crowser, 1999a).

**Berth 501-Barge.** A sediment quality characterization study on the barge side of Berth 501 was completed in 1996. The study indicated that concentrations of metals, polynuclear aromatic hydrocarbons (PAHs), pesticides, and polychlorinated biphenyls (PCBs) were below Puget Sound Dredge Disposal Analysis (PSDDA) screening levels. However, tributyltin (TBT) was found in sediments above the PSDDA screening levels. The TBT concentration was 190 µg/kg, compared to the 1996 PSDDA screening level of 73 µg/kg (Hart Crowser, 1997).

**Berth 503.** In 1995, dredged material testing at Berth 503 determined that the sediments were suitable for unconfined, open-water disposal at Morgan Bar. The physical analysis of the Berth 503 sediment indicated that the material was fine-grained (silt and clays). Maintenance dredging at Berth 503 was conducted in 1996 and removed approximately 10,000 cubic yards of sediment.

## **1.3 Site Description**

Terminal 5 is located on the Willamette River at approximately river mile 1.0 (Figure 1). Berth 501, which was constructed between 1974 and 1975, is operated by Columbia Grain, Inc., and is used for the receipt and shipment of grain. The face side of Berth 501 is used for loading and unloading deep draft ocean-going grain ships. The barge side of Berth 501 is used for the berthing of shallow draft barges. Berth 503 is a dry bulk terminal for Canpotex and handles potash.

## **1.4 Permitting**

The Corps has granted a permit to the Port for routine maintenance dredging of terminals. This permit (permit number 8760) expires on February 1, 2001. Additionally, the Port has received from the Corps a permit for disposal at Morgan Bar of material found suitable for unconfined, open-water disposal.

Designation of acceptable disposal site(s) based on results of sediment characterization proposed herein is a critical remaining element prior to final project design.

## **1.5 Report Organization**

The main body of the report discusses the results of the sediment characterization study and the dredge material disposal options based upon comparisons with LCRMA-SLs and the State of Washington Sediment Quality Standards (SQS) for chromium. Supporting discussions within the text include a description of sediment sampling methods, site locations, and any modifications to the Sampling and Analysis Plans (SAP) provided to the Port by Hart Crowser (December 13, 1999b).

## **2.0 SEDIMENT CHARACTERIZATION STUDY**

Subsurface sediment sampling was conducted as part of this study and is described in detail in the following sections of this report. The overall objective of this study was to collect, analyze, and characterize the sediment quality of the proposed dredge material from each berthing area. Study results are presented below in order to enable the Corps, Environmental Protection Agency (EPA), and Oregon Department of Environmental Quality (DEQ) to designate agency approved disposal option(s) for the proposed dredge material.

### **2.1 Subsurface Sediment Core Sampling**

Subsurface sediment samples were collected at five locations as shown on Figures 2 and 3. Table 1 presents the sediment sample identification, core positioning coordinates, mudline elevations, and composite identifications. Grain size percentages and descriptions are presented in Table 2. The composited subsurface sediment samples were analyzed for metals, TBT, pesticides, PCBs, and semivolatiles. Analytical results are listed in Table 3. Subsurface sediment sampling was conducted in general accordance with the approved project SAP (Hart Crowser, 1999b).

To obtain subsurface samples, sediment cores were collected using a vibracore deployed from the research vessel *R/V Nancy Anne*. The vibracore is a sediment collection instrument consisting of a 4-inch-diameter aluminum core tube attached to a vibrating head that operates at approximately 10,000 cycles per minute, thus vibrating the core tube down into the sediment. A catcher retains sediment in the tube and the sample is brought on board the sampling vessel for processing. Percent recoveries, core logs, and geologic descriptions are compiled in Appendix B.

## **2.2 Sediment Sampling and Compositing Scheme**

The SAP was developed with consideration of site-specific project and environmental factors. A key requirement was assuring that if an individual DMMU is found unsuitable for unconfined, open-water disposal, then that unit can be feasibly dredged independently from surrounding clean sediments so that the contaminated material can be disposed of at an alternate approved, confined, in-water site.

### **2.2.1 Sampling Scheme**

Two sediment cores (HC-VC-B501-01 and HC-VC-B501-02) were collected for the DMMU B501-Face (Figure 2). The two sediment cores were composited together, homogenized, and submitted for chemical analysis as HC-B501-C1 (Figure 4).

One sediment core (HC-VC-B501-03) was collected for the DMMU B501-Barge. Sediments were homogenized and submitted for chemical analysis as HC-Barge-C1 (Figure 5).

Two sediment cores (HC-VC-B503-01 and HC-VC-B503-02) were collected for the DMMU B503 (Figure 3). The two sediment cores were composited together, homogenized, and submitted for chemical analysis as HC-B503-C1 (Figure 6).

Percent recoveries, core logs, and geologic descriptions of each individual sediment core are compiled in Appendix B.

### **2.2.2 Compositing Scheme**

Sample compositing was conducted for each proposed DMMU, with the exception of DMMU B501-Barge (See Table 1). The goal of sample compositing was to control analytical chemistry costs while maintaining the overall objective of obtaining an accurate representation and definition of the sediment quality in each dredging area. Individual subsurface sediment samples from DMMU B501-Face and DMMU B503 were archived for potential future purposes. If a DMMU composite sample were to exceed any LCRMA-SLs, individual archived samples could be utilized for segmentation into smaller DMMUs.

## **3.0 SEDIMENT CHEMICAL ANALYSIS**

The overall data quality objectives for collection and chemical testing of subsurface sediment samples were met, as set forth in the Quality Assurance Protection Plan (QAPP) (Hart Crowser, 1999b). Therefore, the data for this project are acceptable for use as qualified. The Data Quality Review is presented in Appendix A. The laboratory certificates from the chemical analysis and the grain size distribution curves are provided in Appendix C.

### ***3.1 Exceedences of Sediment Quality Criteria***

This section presents comparisons of chemical concentrations detected in Berth 501 and Berth 503 site sediments with the LCRMA-SLs and SQS (for chromium) chemical criteria.

#### **3.1.1 Berth 501-Face**

Analytical results for all potential constituents of concern were below LCRMA-SLs and SQS (for chromium) chemical criteria at Berth 501-Face with the exception of TBT. TBT was detected at 3.5 µg/L, which exceeded the LCRMA-SL of 0.15 µg/L (Table 3). Based on the exceedence of the LCRMA-SL, this material is unlikely to be approved for unconfined, open-water disposal without Tier III biological testing.

#### **3.1.2 Berth 501-Barge**

Sediments from DMMU B501-Barge should be considered suitable for unconfined, open-water disposal as all detected potential constituents of concern were at concentrations below corresponding LCRMA-SLs (Table 3).

#### **3.1.3 Berth 503**

Sediments from DMMU B503 should be considered suitable for unconfined, open-water disposal as all detected potential constituents of concern were at concentrations below corresponding LCRMA-SLs (Table 3).

### ***3.2 Modifications to the Sampling and Analysis Plan***

Due to the TBT exceedence of the LCRMA-SL for the composite sample of Berth 501-Face, it was recommended that each of the two individual core samples (HC-VC-B503-01 and HC-VC-B503-02) collected within the DMMU be analyzed for TBT. Sediments from both of the individual core samples HC-B501-01 and HC-B501-02 exceeded the LCRMA-SL for TBT with concentrations of 0.50 µg/L and 0.70 µg/L, respectively. This confirms that further evaluation using Tier III

bioassay testing would be required for this DMMU to determine if unconfined, open-water disposal is an appropriate option for the proposed dredge sediments. Analytical results of the individual cores with comparison to the composite sample are presented in Table 4.

## 4.0 CONCLUSIONS

Three sediment samples, representing three DMMUs, were submitted for Tier II chemical analyses. At DMMUs B501-Barge and B503, Tier II chemical testing indicated that the proposed dredge material should be considered suitable for unconfined, open-water disposal. At DMMU B501-Face, Tier II chemical testing indicated an exceedence of the LCRMA-SL for TBT. To determine if unconfined, open-water disposal is an appropriate option for DMMU B501-Face dredge sediments, we recommend conducting Tier III bioassay testing.

## 5.0 REFERENCES

- Hart Crowser, 1997. *Sediment Characterization Study, River Terminals 1, 2, and 5, Willamette River*. Prepared for Port of Portland, Portland, Oregon. January 14, 1997.
- Hart Crowser, 1999a. *Volume I: Sediment Characterization Study of Local Sponsors' Berths; Columbia and Willamette River Navigation Channel Deepening; Longview and Kalama, Washington, and Portland, Oregon*. Prepared for Port of Portland. Port Project No. 51773, Port Task No. 220. February 1, 1999.
- Hart Crowser, 1999b. *Sampling and Analysis Plan for Sediment Characterization at Marine Terminal 5, Barge Berth 501 and Berth 503*. Prepared for Port of Portland, Portland, Oregon. December 13, 1999.

**HART CROWSER, INC.**

**HOWARD L. CUMBERLAND**  
Associate

Port of Portland, Terminal 5, Berth 501 and Berth 503  
Portland, Oregon

v-0500

Subsurface Core Location	Latitude	Longitude	Approximate Mudline Elevation in Feet (CRD)	Core Sample Bottom Elevation in Feet (CRD)	Chemistry Sample Length (Feet)	Sample Length Archived (Feet)	Chemistry Sample Identification	DMMU Identification
Berth 501-Face								
HC-VC-B501-01	45° 38.533'	122° 46.254'	-39	-43	3	1	HC-B501-C1	B501-Face
HC-VC-B501-02	45° 38.547'	122° 46.327'	-37	-43	5	1		
Berth 501-Barge								
HC-VC-B501-03	45° 38.528'	122° 46.314'	-11	-18	6	1	HC-Barge-C1	B501-Barge
Berth 503								
HC-VC-B503-01	45° 38.290'	122° 46.755'	-40	-43	2	1	HC-B503-C1	B503
HC-VC-B503-02	45° 38.278'	122° 46.776'	-37	-43	5	1		

Notes:

CRD: Columbia River Datum.

**Table 2 - Sediment Grain Size Summary  
Port of Portland, Terminal 5, Berth 501 and Berth 503  
Portland, Oregon**

Hart Crowser  
J-5930

DMMU Identification	%Sand/Gravel >75 µm	%Silt/Clay <75 µm	Material Description
B501-Face	98.0	2.0	Fine to medium SAND
B501-Barge	98.0	2.0	Fine to medium SAND
B503	32.0	68.0	Very sandy SILT

**Table 3 - Analytical Results for Subsurface Sediment Samples**  
**Port of Portland, Terminal 5, Berth 501 and Berth 503**  
**Portland, Oregon**

Hart Crowser  
J-5930

Lab ID Sample ID Sampling Date	K9908537-001 HC-B501-C1 11/22/1999	K9908537-006 HC-Barge-C1 11/22/1999	K9908537-010 HC-B503-C1 11/22/1999	LCRMA	
				SL	ML
<b>Conventional in mg/kg</b>					
Ammonia as Nitrogen	56.2	6.67	142	--	--
Sulfide, Total	0.9 U	0.9 U	30	--	--
<b>Conventional in %</b>					
Carbon, Total Organic	0.11	0.05	1.48	--	--
Solids, Total	77.1	82.7	55.5	--	--
Solids, Total Volatile	1.72	1.14	6.27	--	--
<b>Metals in mg/kg</b>					
Antimony	0.09	0.06	0.18	150	200
Arsenic	3.7	2	5.1	57	700
Cadmium	0.18	0.08	0.67	5.1	14
Chromium	11	7.5	24.9	270*	--
Copper	14.8	8.31	37.9	390	1,300
Lead	4.65	3.21	16.5	450	1,200
Mercury	0.01	0.02	0.05	0.41	2.3
Nickel	14.8	11.7	23.2	140	370
Silver	0.06	0.04	0.24	6.1	8.4
Zinc	65.8	34.2	122	410	3,800
<b>LPAHs in µg/kg</b>					
Acenaphthene	6 U	6 U	7	500	2,000
Acenaphthylene	6 U	6 U	6 U	560	1,300
Anthracene	6 U	6 U	8	960	13,000
Fluorene	6 U	6 U	6 U	540	3,600
Naphthalene	6 U	6 U	6 U	2,100	2,400
2-Methylnaphthalene	6 U	6 U	6 U	670	1,900
Phenanthrene	13	6 U	36	1,500	21,000
<b>HPAHs in µg/kg</b>					
Benz(a)anthracene	6	6 U	33	1,300	5,100
Benzo(a)pyrene	7	6 U	43	1,600	3,600
Benzo(b)fluoranthene	8	10 U	38	--	--
Benzo(k)fluoranthene	7	10 U	31	--	--
Benzo(b+k)fluoranthene				3,200	9,900
Benzo(g,h,i)perylene	6 U	6 U	36	670	3,200
Chrysene	9	6 U	43	1,400	21,000
Dibenz(a,h)anthracene	6 U	6 U	6	230	1,900
Fluoranthene	18	6 U	65	1,700	30,000
Indeno(1,2,3-cd)pyrene	6 U	6 U	34	600	16,000
Pyrene	15	6 U	71	2,600	16,000
<b>Tributyltin in µg/L (2)</b>					
n-Butyltin	0.22	0.09	0.05 U	--	--
Di-n-butyltin	0.34	0.10	0.05 U	--	--
Tri-n-butyltin	3.5	0.08	0.03	0.15	--
Tetra-n-butyltin	0.05 U	0.05 U	0.05 U	--	--

Refer to Notes at the end of this table.

**Table 3 - Analytical Results for Subsurface Sediment Samples**  
**Port of Portland, Terminal 5, Berth 501 and Berth 503**  
**Portland, Oregon**

Hart Crowser  
J-5930

Lab ID Sample ID Sampling Date	K9908537-001	K9908537-006	K9908537-010	LCRMA	
	HC-B501-C1 11/22/1999	HC-Barge-C1 11/22/1999	HC-B503-C1 11/22/1999	SL	ML
<b>Pesticides in µg/L</b>					
gamma-BHC (Lindane)	5 U	5 U	5 U	10	--
Heptachlor	5 U	5 U	5 U	10	--
Aldrin	5 U	5 U	5 U	10	--
gamma-Chlordane	5 U	5 U	5 U	--	--
alpha-Chlordane	5 U	5 U	5 U	10	--
Dieldrin	5 U	5 U	5 U	10	--
4,4'-DDE	5 U	5 U	5 U	--	--
4,4'-DDD	5 U	5 U	5 U	--	--
4,4'-DDT	5 U	5 U	5 U	--	--
Total DDT				6.9	69
<b>Semivolatiles in µg/kg</b>					
Benzoic Acid	50 U	50 U	50 U	650	760
Benzyl Alcohol	50 U	50 U	50 U	57	870
Dibenzofuran	6 U	6 U	6 U	540	1,700
Hexachlorobenzene	10 U	10 U	10 U	22	230
Hexachlorobutadiene	10 U	10 U	10 U	29	270
Hexachloroethane	10 U	10 U	10 U	1,400	14,000
N-Nitrosodiphenylamine	10 U	10 U	10 U	28	130
<b>Volatiles in µg/kg</b>					
1,3-Dichlorobenzene	10 U	10 U	10 U	170	--
1,4-Dichlorobenzene	10 U	10 U	10 U	110	120
1,2-Dichlorobenzene	10 U	10 U	10 U	35	110
1,2,4-Trichlorobenzene	10 U	10 U	10 U	31	64
<b>Phenols in µg/kg</b>					
2,4-Dimethylphenol	10 U	10 U	10 U	29	210
2-Methylphenol	10 U	10 U	10 U	63	77
4-Methylphenol	10 U	10 U	10 U	670	3,600
Pentachlorophenol (PCP)	10 U	10 U	10 U	400	690
Phenol	10 U	10 U	10 U	420	1,200
<b>Phthalates in µg/kg</b>					
Bis(2-ethylhexyl) Phthalate	35 U	35 U	97	8,300	--
Butyl Benzyl Phthalate	35 U	35 U	35 U	970	--
Di-n-butyl Phthalate	35 U	35 U	35 U	5,100	--
Di-n-octyl Phthalate	35 U	35 U	35 U	6,200	--
Diethyl Phthalate	35 U	35 U	35 U	1,200	--
Dimethyl Phthalate	35 U	35 U	35 U	1,400	--

Refer to Notes at the end of this table.

**Table 3 - Analytical Results for Subsurface Sediment Samples**  
**Port of Portland, Terminal 5, Berth 501 and Berth 503**  
**Portland, Oregon**

Hart Crowser  
J-5930

Lab ID Sample ID Sampling Date	K9908537-001 HC-B501-C1 11/22/1999	K9908537-006 HC-Barge-C1 11/22/1999	K9908537-010 HC-B503-C1 11/22/1999	LCRMA	
	SL	ML			
<b>PCBs in mg/kg</b>					
Aroclor 1016	10 U	10 U	10 U	--	--
Aroclor 1221	20 U	20 U	20 U	--	--
Aroclor 1232	10 U	10 U	10 U	--	--
Aroclor 1242	10 U	10 U	10 U	--	--
Aroclor 1248	10 U	10 U	10 U	--	--
Aroclor 1254	10 U	10 U	10 U	--	--
Aroclor 1260	10 U	10 U	10 U	--	--
Total PCBs				130	3,100

**Notes:**

LCRMA: Dredged Material Evaluation Framework Lower Columbia River Management Area

SL: Screening Level

ML: Maximum Level

-- Not Available

\*: Washington State Sediment Quality Standard (SQS) for chromium

U: Not detected at the indicated method reporting limit

(1): Porewater unfiltered

**Exceeds Sediment Quality Screening Level**

**Table 4 - TBT Concentrations in Subsurface Sediment Samples, Berth 501-Face  
Port of Portland, Terminal 5, Berth 501 and 503  
Portland, Oregon**

Hart Crowser  
J-5930

	Initial Composite	Subsample Analysis		LCRMA	
		K2000914-001	K2000914-002		
		HC-B501-01	HC-B501-02		
		11/22/1999	11/22/1999	11/22/1999	11/22/1999
	Date Porewater Extracted	12/1/1999	2/15/2000	2/15/2000	2/15/2000
<b>Conventionals in %</b>				SL	ML
Solids, Total	77.1	79.0	77.5	--	--
<b>Tributyltin in µg/L (1)</b>					
n-Butyltin	0.22	0.06 U	0.06 U	--	--
Di-n-butyltin	0.34	0.07	0.07	--	--
Tri-n-butyltin	3.5	0.50	0.70	0.15	--
Tetra-n-butyltin	0.05 U	0.06 U	0.06 U	--	--

**Notes:**

LCRMA: Dredged Material Evaluation Framework Lower Columbia River Management Area

SL: Screening Level

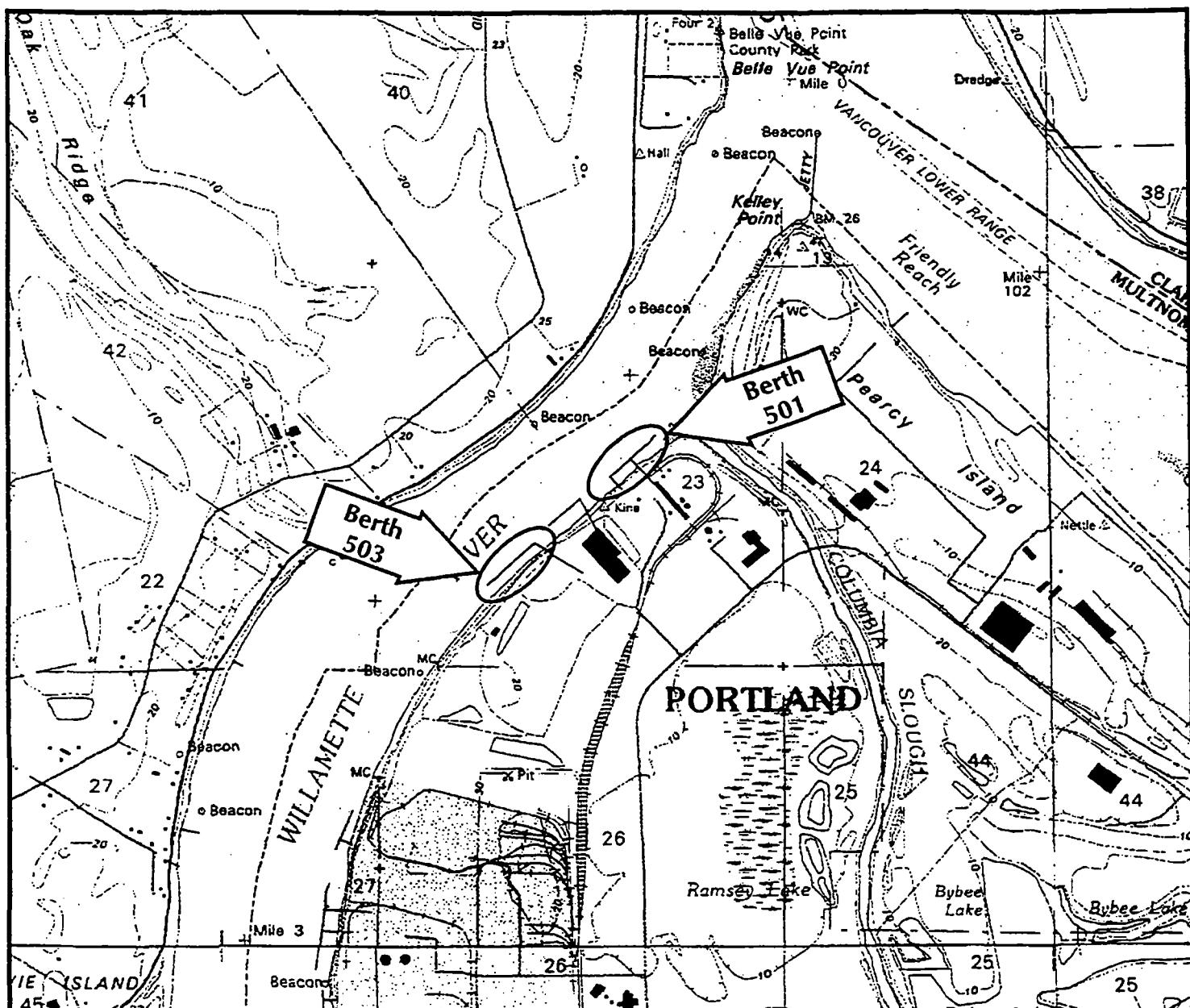
ML: Maximum Level

-- Not Available

(1): Porewater unfiltered

Exceeds Sediment Quality Screening Level

**Site Location Map  
Port of Portland  
Terminal 5 - Berth 501 and 503**



Note: Base map prepared from the USGS 7.5-minute quadrangles of Sauvie Island, Portland, Lintton, Oregon, dated 1990 and Vancouver, Washington, dated 1990.

SCALE 1 : 24 000

1       $\frac{1}{2}$       0      1 MILE  
1000    0    1000    2000    3000    4000    5000    6000    7000 FEET

CONTOUR INTERVAL 10 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

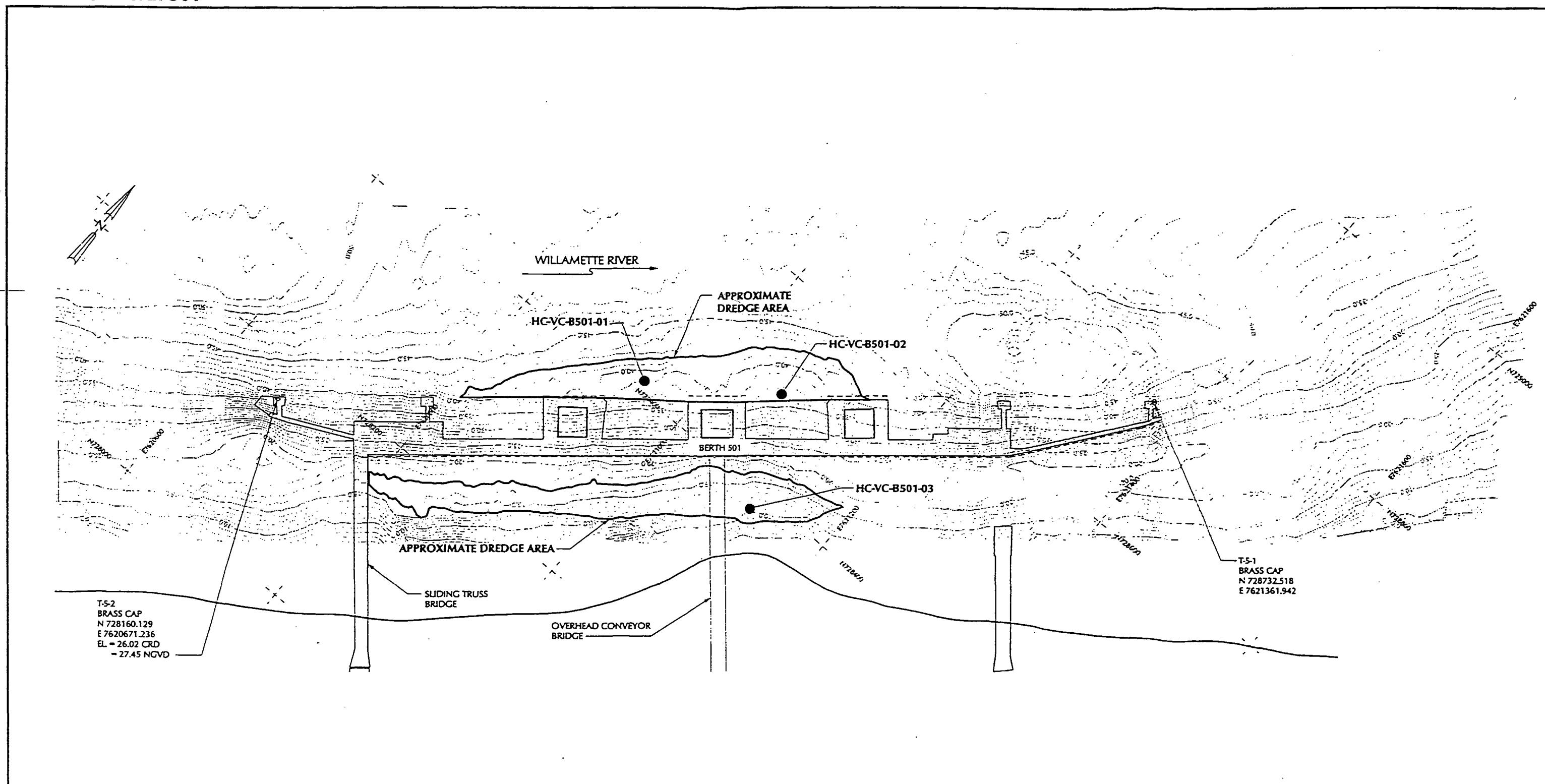


**HARTCROWSER**  
J-5930  
Figure 1  
3/00

# Vibracore Sampling Locations at Berth 501 Berthing Areas

Port of Portland

Terminal 5 - Berth 501



Note: Base map prepared from a plan provided by the Port of Portland.

## Legend:

HC-VC-B501-03 ● Core Sample Location and Designation

0 100 200  
Approximate Scale in Feet



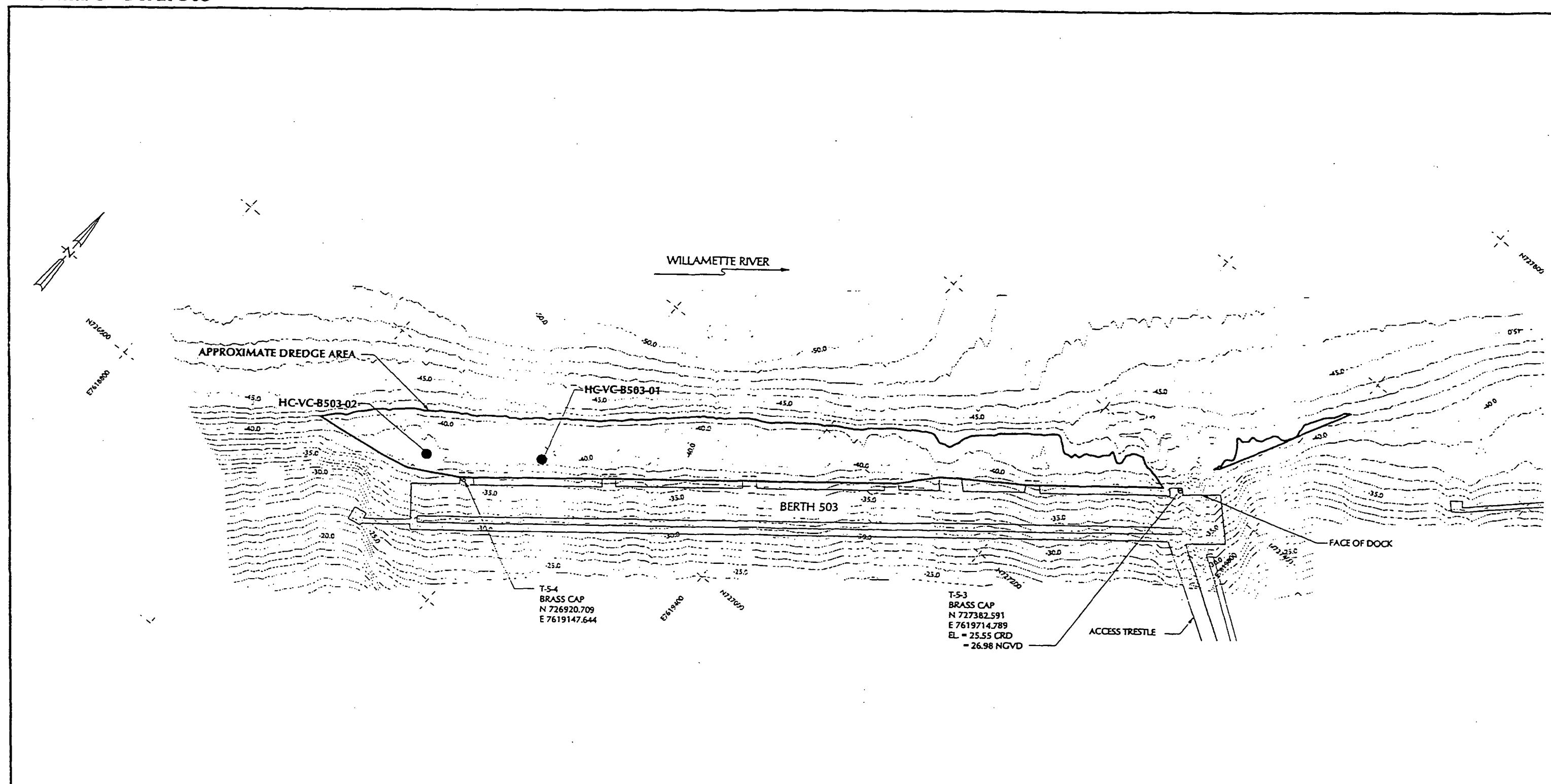
**HARTCROWNE**

J-5930  
Figure 2

# Vibracore Sampling Locations at Berth 503 Berthing Area

Port of Portland

Terminal 5 - Berth 503



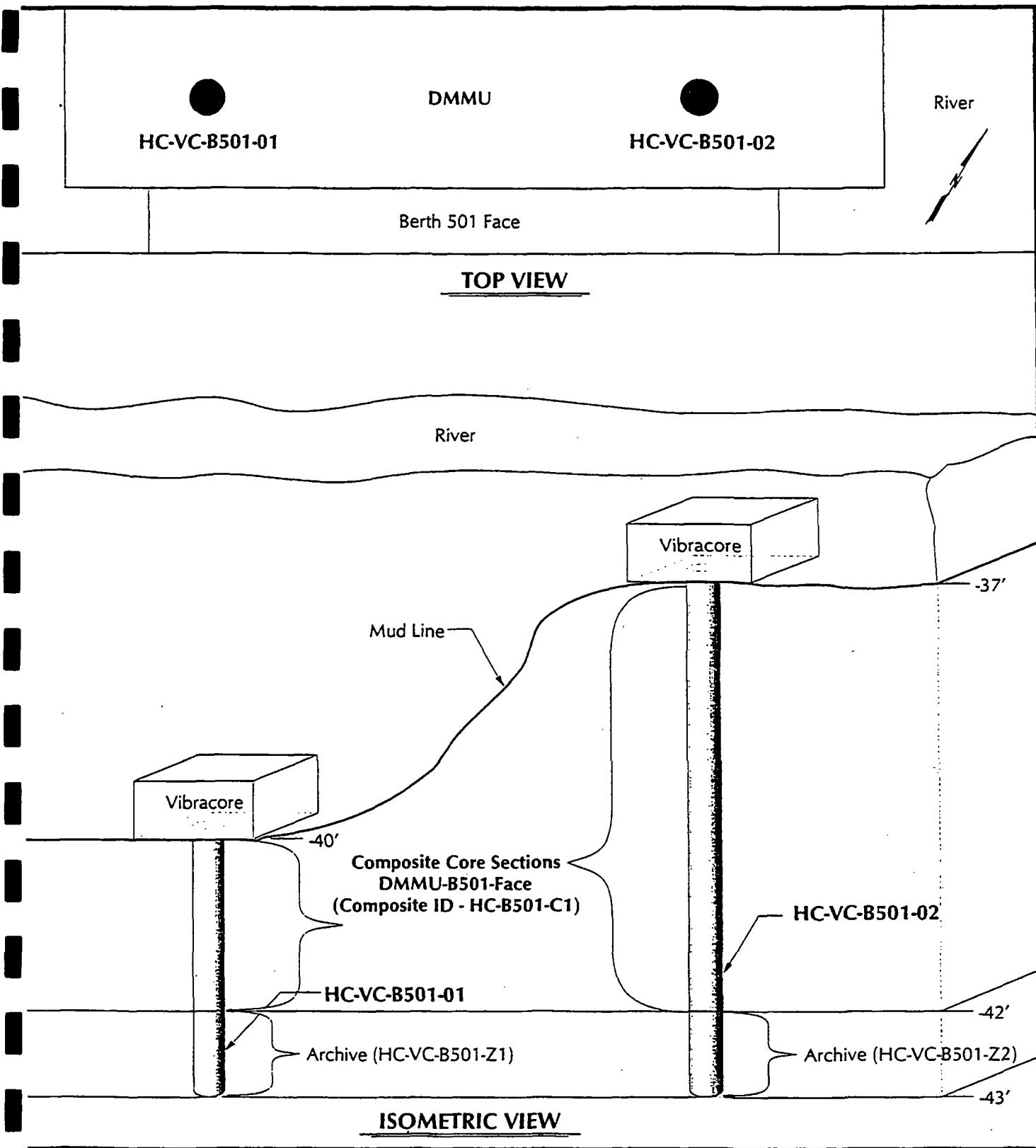
Note: Base map prepared from a plan provided by the Port of Portland.

## Legend:

HC-VC-B503-01 ● Core Sample Location and Designation

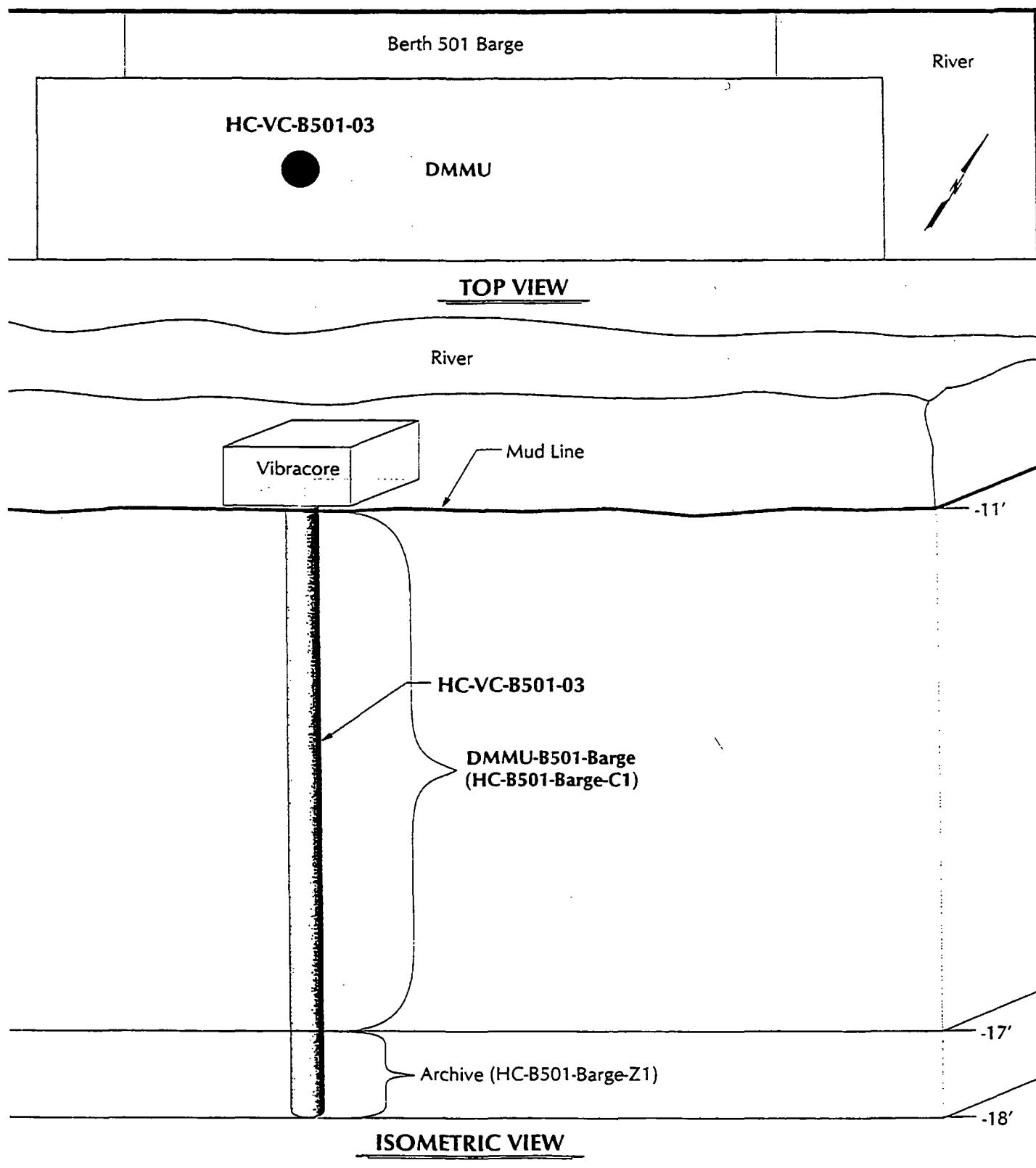
0 100 200  
Approximate Scale in Feet

# Vibracore Sampling Depths at Berth 501 - Face Berthing Area Port of Portland, Terminal 5 - Berth 501



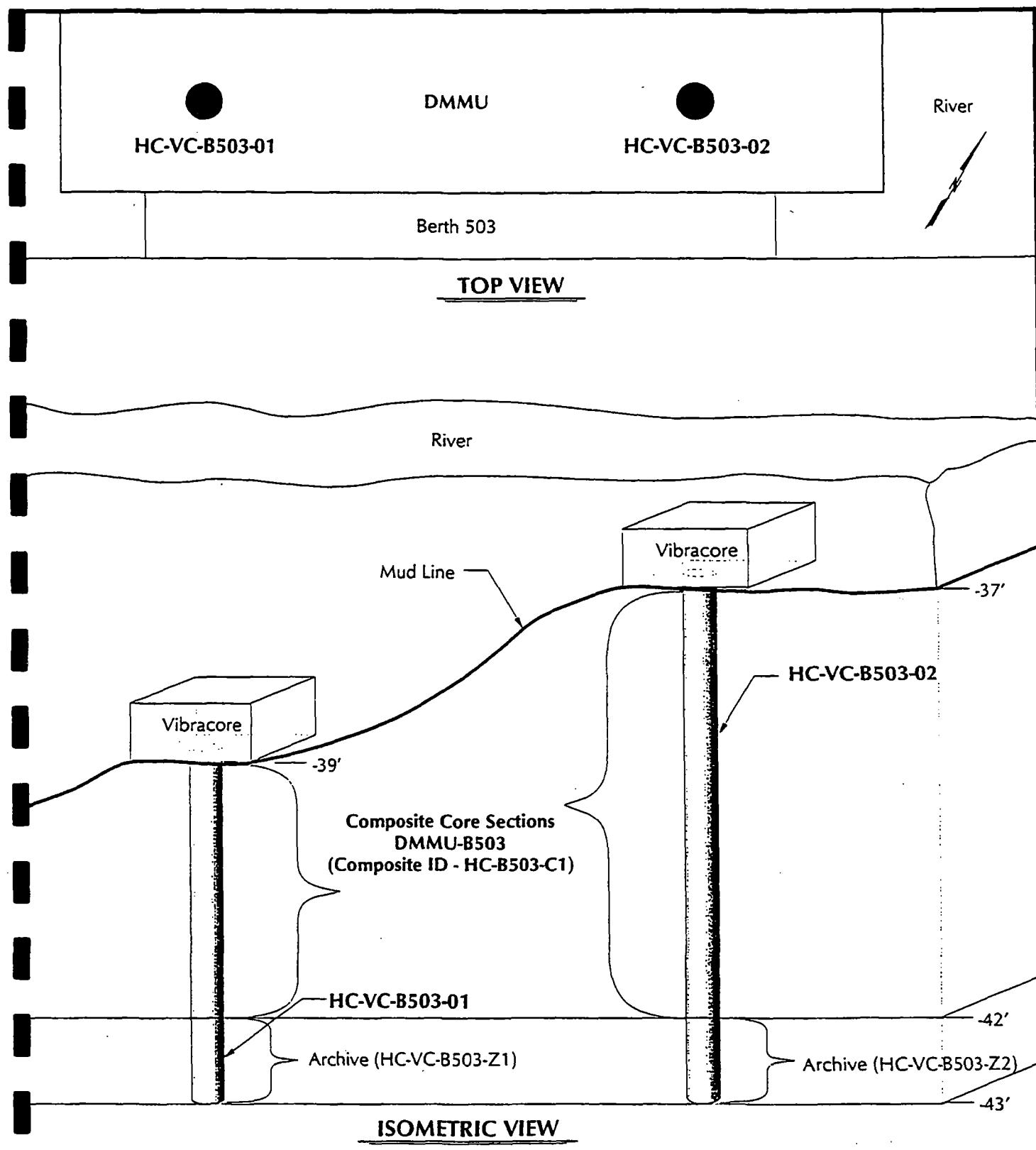
Not to Scale

# bracore Sampling Depth at Berth 501 - Barge Berthing Area Port of Portland, Terminal 5 - Berth 501



Not to Scale

# Vibracore Sampling Depths at Berth 503 Port of Portland, Terminal 5 - Berth 503



Not to Scale

**APPENDIX A**  
**CHEMICAL DATA QUALITY REVIEW**

## **APPENDIX A**

### **CHEMICAL DATA QUALITY REVIEW**

A standard data quality review was performed by Hart Crowser on the analytical data package submitted by Columbia Analytical Services (CAS) of Kelso, Washington and is presented below. This data quality review was conducted on all sediment samples submitted to CAS for analyses. Analyses included samples collected from three separate Dredge Material Management Units (DMMUs) at Terminal 5 in order to characterize the sediments for dredging and disposal. The data quality review concluded that the chemistry data are acceptable for evaluation of sediment disposal options and none of the data from this study were qualified.

In total, nine sediment samples were collected on November 22, 1999. Of the nine samples collected, three composite samples were submitted for chemical analyses. Additional collected samples were archived for potential future analysis (if necessary). The samples were submitted to CAS for analysis of the following:

- Total Metals (EPA Methods 6020/6010A/7471);
- Semivolatile Organics (GC/MS SIM);
- Pesticides/Polychlorinated biphenyls (PCBs) (EPA Method 8080A);
- Tributyltin (TBT, GC/FPD);
- Total Organic Carbon (ASTM D4129-82M);
- Ammonia (EPA Method 350.1M);
- Sulfide (PSEP);
- Percent Solids (PSEP);
- Total Volatile Solids (EPA Method 160.4M); and
- Total Solids (EPA Method 160.3).

In response to detected concentrations of TBT, it was determined that additional chemical testing on archived samples HC-VC-B501-01 and HC-VC-B501-02 was necessary. The two samples were analyzed for the following:

- Tributyltin (TBT, GC/FPD); and
- Total Volatile Solids (EPA Method 160.4M).

The following criteria were evaluated in the standard data quality review process for the results:

- Holding times;
- Method blanks;
- Reporting limits;
- Surrogate recoveries;
- Blank spike and laboratory control sample (LCS) recoveries;
- Matrix spike/matrix spike duplicate (MS/MSD) recoveries; and
- Laboratory duplicates relative percent differences (RPDs).

### ***Laboratory Quality Assurance/Quality Control (QA/QC)***

We accomplished a review of the QA/QC information provided by the analytical laboratory performing the chemical analyses. As part of their QA/QC program, the laboratory conducts QA/QC checks on the samples. These include analysis of surrogate compounds, method blanks, matrix spikes, and matrix spike duplicates. The laboratory, in accordance with EPA guidelines, statistically derives acceptability or control limits for analyses. Upon review, all data are suitable for their intended purpose. Please see the laboratory report for QA/QC results.

#### **Sample Analysis**

**Holding Times.** Collection dates for all samples submitted are documented on the chain of custody forms. Collection and extraction/analysis dates are indicated on the laboratory reports. All EPA recommended holding times, with the exception of sulfide determination, were met. Because the holding time for total sulfides was not exceeded by 14 days, samples were not qualified.

**Reporting and Detection Limits.** The laboratory reports two limits: the method detection limit (MDL) and method reporting limit (MRL). The MDL represents the concentration at which the analytical equipment can detect a chemical compound, whereas the MRL is the concentration at which the chemical compound can be accurately quantified. These limits are set by the laboratory and are based on instrumentation abilities, sample matrix, and suggested limits by the regulatory agencies. MRLs were generally consistent with industry standards and were below promulgated regulatory standards.

### Laboratory QA/QC Samples

**Surrogate Analyses.** In a surrogate analysis, a known amount of a compound similar to the constituent of interest is added to a sample and measured. The surrogate analysis assesses the accuracy of a chemical measurement by comparing the measured value to the actual spiked value. Surrogates were added for the butylins, PAH, and PCB/pesticide analyses. All surrogates were within control limits.

**Method Blanks.** A method, or laboratory blank, is a sample prepared in the laboratory along with the actual samples and analyzed for the same parameters at the same time. It is used to assess if detected contaminants may have been the result of contamination of the samples in the laboratory. Chromium and zinc were detected between their respective MDLs and MRLs. Since detections in actual samples were five times their respective MDLs, samples were not qualified.

**Laboratory Duplicates.** A duplicate is a second laboratory sample taken from a submitted sample and prepared along with the original. It is analyzed and compared to the first sample to assess the precision of the analytical method. This comparison is normally expressed by the RPD between the original and duplicate samples. A laboratory duplicate was performed for the total solids, total volatiles, inorganic parameters, and metal analyses. The RPD results were within control limits.

**Matrix Spike Analyses.** Matrix spike analyses are performed on samples submitted to the laboratory, which are of the same matrix as the actual sample. It is spiked with known levels of the constituents of interest. These analyses are used to assess the potential for matrix interference with recovery or detection of the constituents of interest and the accuracy of the determination. The spiked sample results are compared to the expected result (i.e., sample concentration plus spike amount) and are reported as percent recovery. A matrix spike was performed with all requested analyses. The percent recoveries for these matrix spikes were acceptable.

**Laboratory Control Sample.** A laboratory control sample (LCS) was analyzed by the laboratory to assess the accuracy of the analytical equipment. The sample is prepared from analyte-free matrix, which is then spiked with known levels of the constituents of interest (i.e., a standard). The concentrations are measured and the results are compared to the known spiked levels. This comparison is expressed as percent recovery. LCSs were analyzed for all the requested analyses. The LCS percent recoveries were within control limits, except for gamma-BHC (Lindane) in the LCS associated with the pesticide analysis. In this case, gamma-BHC was slightly above acceptance limits, which suggests

instrumentation for this compound was overly sensitive (biased slightly high). Because gamma-BHC was not detected, the data are not affected and results are acceptable.

**LCS Duplicate.** A duplicate of the LCS was also prepared for all requested analyses. The analytical result of the LCS duplicate is compared to the LCS to assess the precision of the analytical method and is expressed by the RPD between the two samples. The RPD results were within control limits.

**Initial and Continuing Calibration Verifications.** Initial and continuing calibration verifications are similar to the LCS. It is analyzed to assure that the analytical equipment is initially calibrated correctly and is then retaining its initial calibration. Results of these analyses are expressed as percent recovery. The RPD results were within control limits.

**APPENDIX B**  
**SEDIMENT CORE LOGS**

# Key for Soil/Sediment Logs

## Sample Description

Classification of soils in this report is based on visual field and laboratory observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field nor laboratory testing unless presented herein. Visual-manual classification methods of ASTM D 2488 were used as an identification guide.

Soil descriptions consist of the following:

Density/consistency, moisture, color, minor constituents, MAJOR CONSTITUENT, additional remarks.

## Density/Consistency

Soil density/consistency in borings is related primarily to the Standard Penetration Resistance.

Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SAND or GRAVEL Density	Standard Penetration Resistance (N) in Blows/Foot	SILT or CLAY Consistency	Standard Penetration Resistance (N) in Blows/Foot	Approximate Shear Strength in TSF
Very loose	0 - 4	Very soft	0 : 2	<0.125
Loose	4 - 10	Soft	2 : 4	0.125 - 0.25
Medium dense	10 - 30	Medium stiff	4 : 8	0.25 - 0.5
Dense	30 - 50	Stiff	8 : 15	0.5 - 1.0
Very dense	>50	Very stiff	15 : 30	1.0 - 2.0
		Hard	≥30	>2.0

## Moisture

Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

## Minor Constituents

	Estimated Percentage
Not identified in description	0 : 5
Slightly (clayey, silty, etc.)	5 : 12
Clayey, silty, sandy, gravelly	12 : 30
Very (clayey, silty, etc.)	30 : 50

## Legends

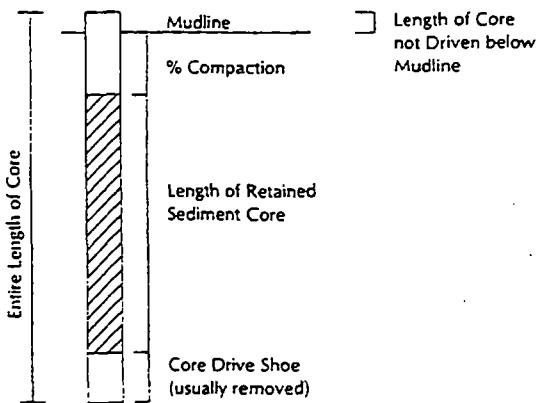
### Sample Acceptability Criteria:

- Overlying water is present
- Water has low turbidity
- Sampler is not overfilled
- Surface is flat
- Penetration depth is acceptable
- Compaction is less than 25 percent
- Core tube is intact

### Estimated Percentage of Other Minor Constituents

(i.e. shells, wood, organics, plastic, metal, brick, refuse)	
Description	Estimated Percentage
Dusting	Trace on Surface
Trace	Discernible
Scattered	0.5
Moderate	5-20
Substantial	20-50
Major Constituent	≥50

## Core Observations



— Major Sediment Unit Contacts

- - - Minor Sediment Unit Contacts

## Test Symbols

CHEM	Chemical Testing
GS	Grain Size
ARCH	Archive
	Continuous Vibracore
AL	Atterberg Limits
SP.GR	Specific Gravity
Rad	Radio Isotopes Pb-210 and Cs-137



**HARTCROWSER**

J-5930  
Figure B-1

3/00

# Sediment Core Log HC-VC-B501-01

Type of Sample: 4-inch Vibracore

Date/Time: 11-22-99

Recovery Length in Feet: 12.5

Total Drive Depth below Mudline in Feet: 13

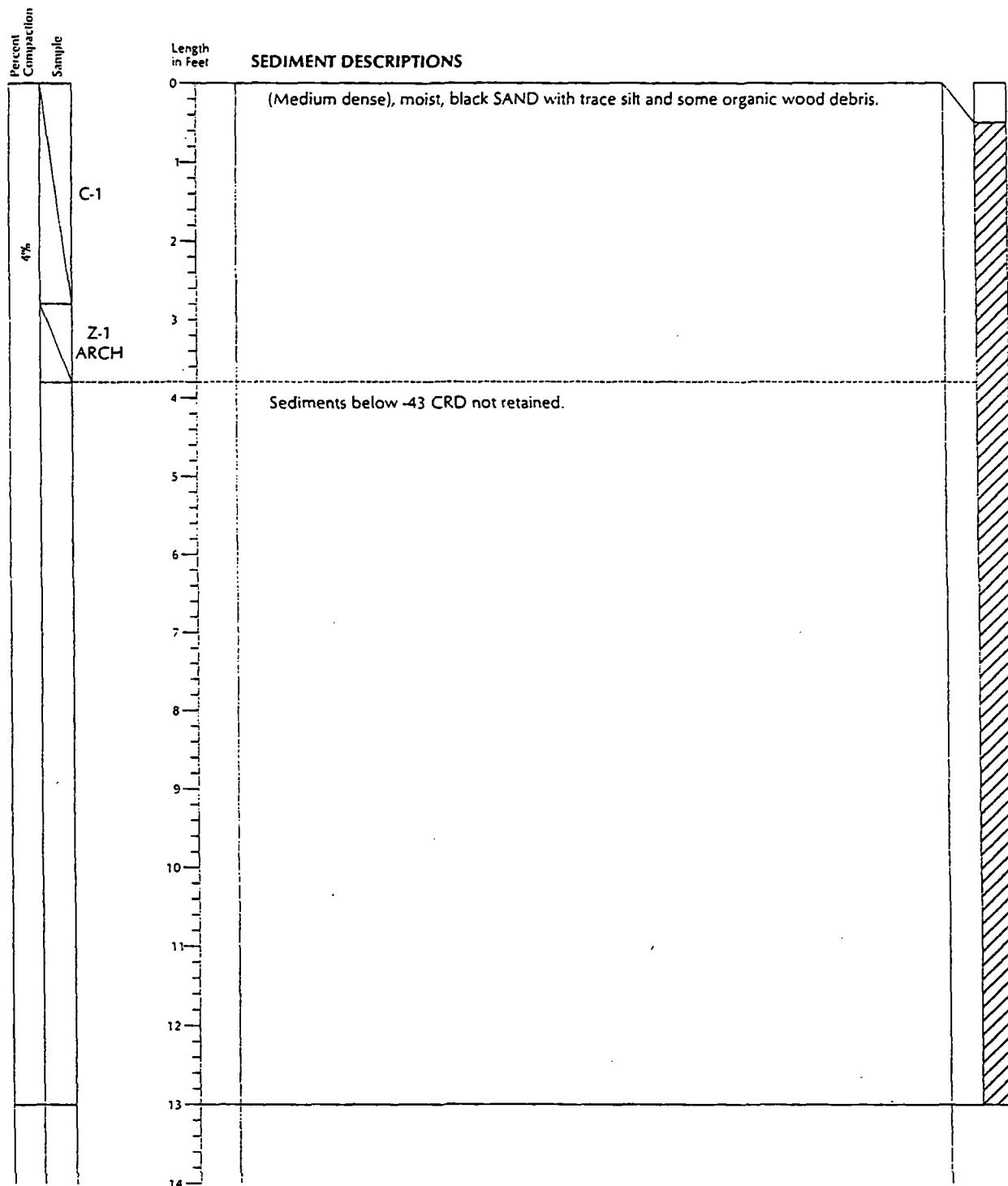
Northing: 728413.27379

Easting: 7620945.79083

Mudline Elevation in Feet: -39.5

Core Tube Length in Feet: 14.0

Core Tube  
and Sediment  
Recovery



## Notes:

1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum - (DGPS) - Oregon State Plane Coordinates and vertical control is based on Columbia River Datum (CRD).

# Sediment Core Log HC-VC-B501-02

Type of Sample: 4-inch Vibracore

Northing: 728495.02173

Date/Time: 11-22-99

Easting: 7621065.35995

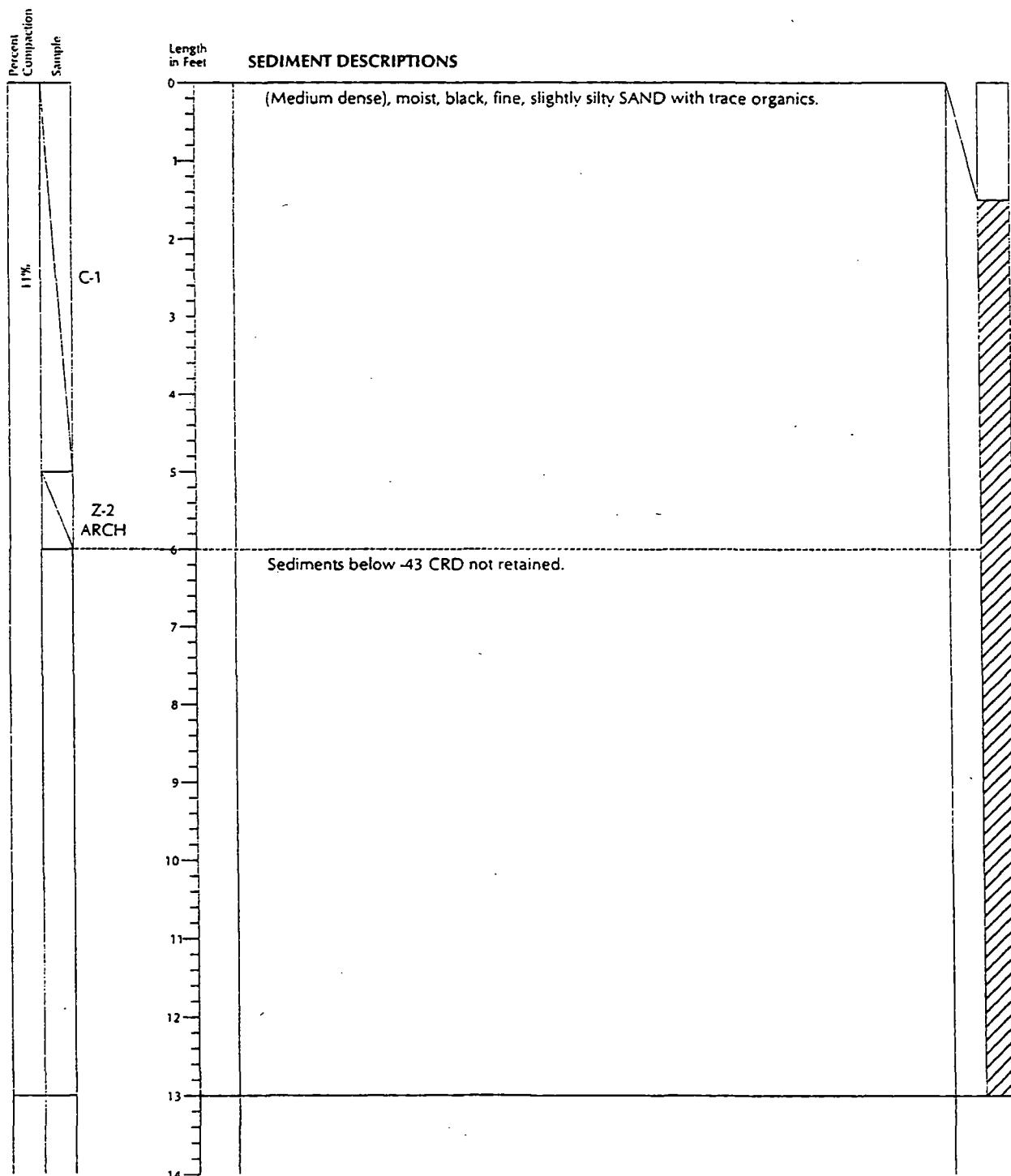
Recovery Length in Feet: 11.5

Mudline Elevation in Feet: -37.0

Total Drive Depth below Mudline in Feet: 13

Core Tube Length in Feet: 14.0

Core Tube  
and Sediment  
Recovery



## Notes:

1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum - (DGPS) - Oregon State Plane Coordinates and vertical control is based on Columbia River Datum (CRD).

# Sediment Core Log HC-VC-B501-03

Type of Sample: 4-inch Vibracore

Date/Time: 11-22-99

Recovery Length in Feet: 11.4

Total Drive Depth below Mudline in Feet: 13

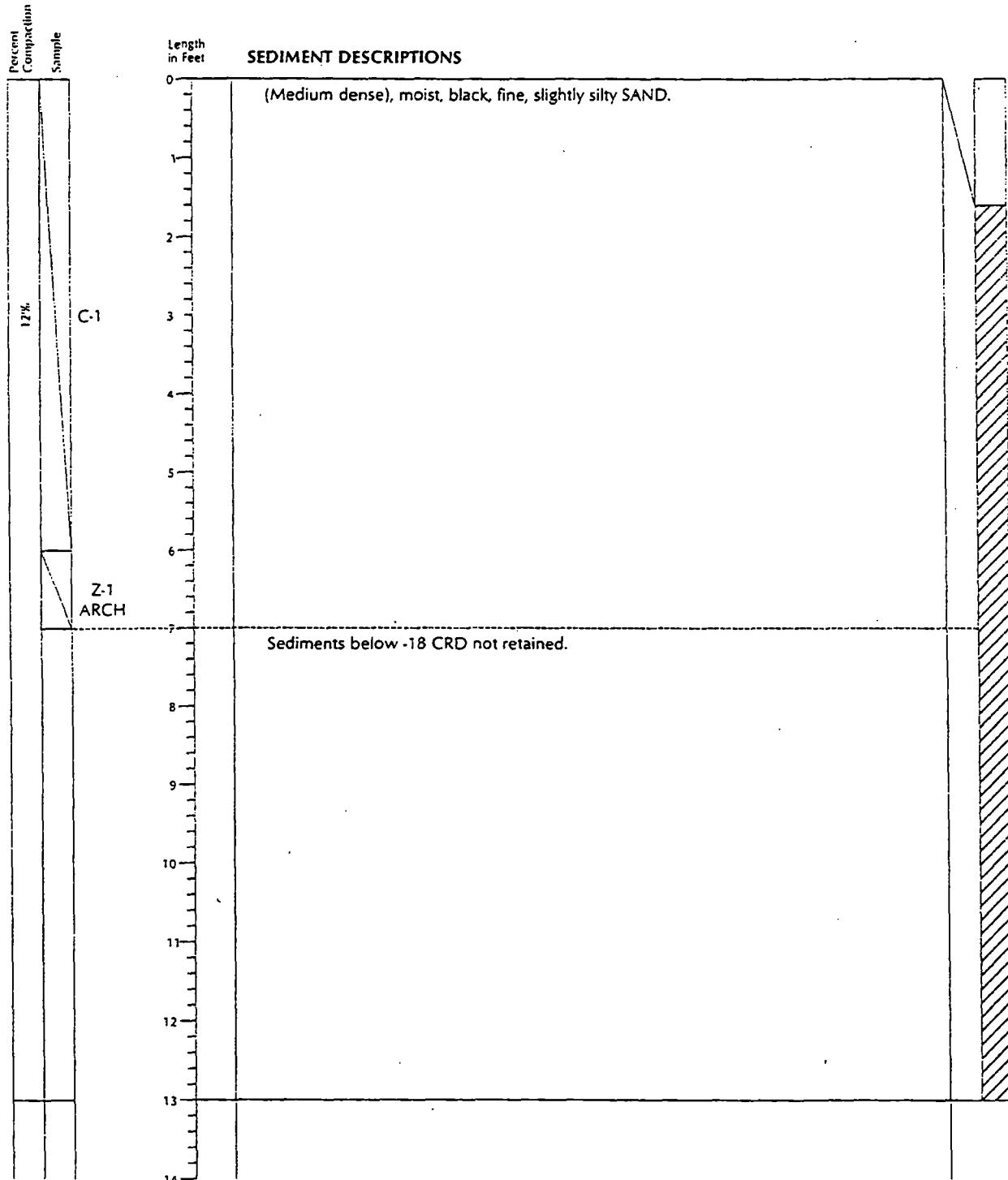
Northing: 728380.51178

Easting: 7621116.29596

Mudline Elevation in Feet: -11.0

Core Tube Length in Feet: 14.0

Core Tube  
and Sediment  
Recovery



## Notes:

1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum - (DGPS) - Oregon State Plane Coordinates and vertical control is based on Columbia River Datum (CRD).

# Sediment Core Log HC-VC-B503-01

Type of Sample: 4-inch Vibracore

Date/Time: 11-22-99

Recovery Length in Feet: 11.5

Total Drive Depth below Mudline in Feet: 13

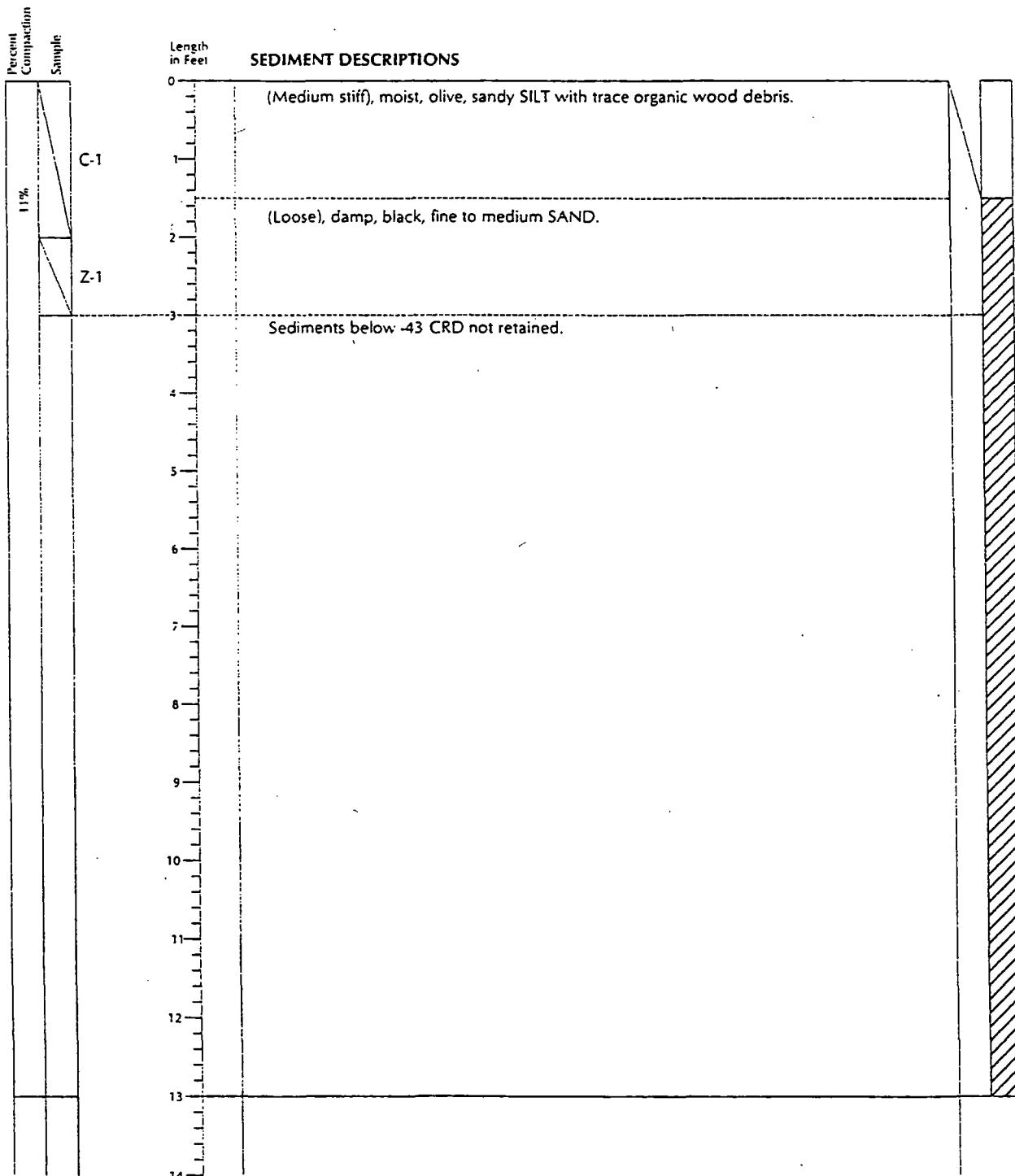
Northing: 726987.71210

Easting: 7619195.98241

Mudline Elevation in Feet: -40.0

Core Tube Length in Feet: 14.0

Core Tube  
and Sediment  
Recovery



## Notes:

1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum - (DGPS) - Oregon State Plane Coordinates and vertical control is based on Columbia River Datum (CRD).

# Sediment Core Log HC-VC-B503-02

Type of Sample: 4-inch Vibracore

Date/Time: 11-22-99

Recovery Length in Feet: 11.0

Total Drive Depth below Mudline in Feet: 13

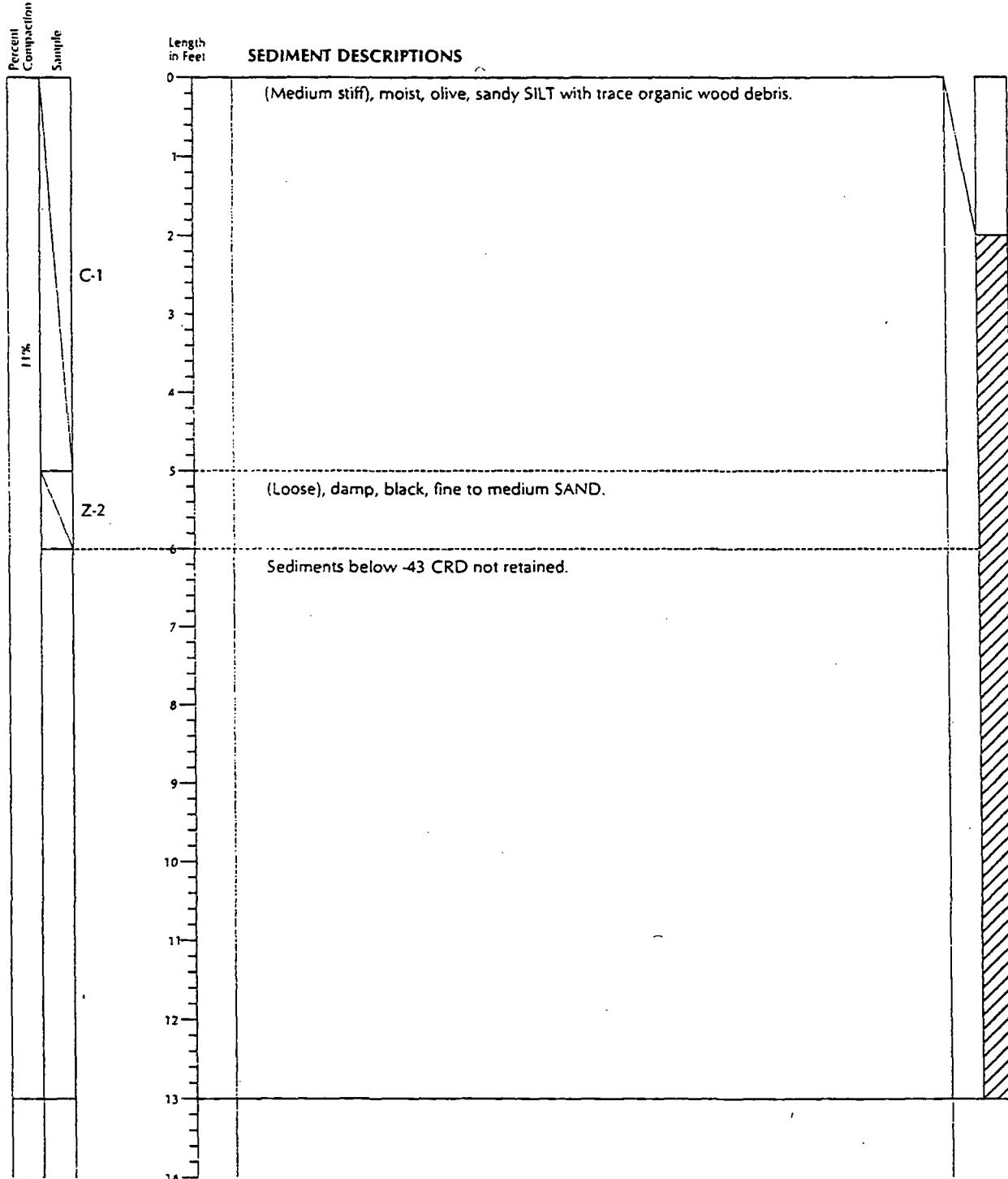
Northing: 726916.18773

Easting: 7619102.27353

Mudline Elevation in Feet: -37.0

Core Tube Length in Feet: 14.0

Core Tube  
and Sediment  
Recovery



## Notes:

1. Sediment contacts are inferred and actual contacts may vary.
2. Horizontal datum - (DGPS) - Oregon State Plane Coordinates and vertical control is based on Columbia River Datum (CRD).

**APPENDIX C**  
**ANALYTICAL CHEMISTRY REPORT,**  
**LABORATORY CERTIFICATIONS, AND**  
**GRAIN SIZE DISTRIBUTION CURVES**

HART CROWSER INC.

DEC 23 1999

Portland Office



December 22, 1999

Service Request No: K9908537

Taku Fuji  
Hart Crowser, Inc.  
Five Centerpointe Drive, Suite 240  
Lake Oswego, OR 97035

Re: **POP-Terminal 5/5930**

Dear Taku:

Enclosed are the results of the sample(s) submitted to our laboratory on November 29, 1999. For your reference, these analyses have been assigned our service request number K9908537.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 243.

Respectfully submitted,

**Columbia Analytical Services, Inc.**



Richard Craven  
Project Chemist

RAC/clb

Page 1 of 193

## Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

**COLUMBIA ANALYTICAL SERVICES, INC.**

**Client:** Hart Crowser Inc.  
**Project:** Port of Portland T 5  
**Sample Matrix:** Sediment

**Service Request No.:** K9908537  
**Date Received:** 29-November-99

**CASE NARRATIVE**

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc. (CAS). This report contains analytical results for sample(s) designated for Tier III data deliverables. When appropriate to the method, method blank results have been reported with each analytical test. Surrogate recoveries have been reported for all applicable organic analyses. Additional quality control analyses reported herein include: Laboratory Duplicate (DUP), Matrix Spike (MS), Matrix/Duplicate Matrix Spike (MS/DMS), Laboratory/Duplicate Laboratory Control Sample (LCS/DLCS), Laboratory Control Sample (LCS), Initial/Continuing Calibration Verification Standards (ICV/CCV), and Initial/Continuing Calibration Blanks (ICB/CCB).

All EPA recommended holding times, except as noted below, have been met for analyses in this sample delivery group.

After receipt at the laboratory the samples were frozen until analysis.

The following difficulties were experienced during analysis of this batch:

**General Chemistry:** The samples were received after the hold times for sulfide determination had expired.

**Metals:** There were no QC failures observed.

**Organotins:** There were no QC failures observed.

**EPA 8081:** There were no QC failures observed.

**EPA 8082:** There were no QC failures observed.

**Semivolatile Organics:** There were no QC failures observed.

Approved by

Date 12/20/99

00003

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Total Solids

Prep Method: NONE

Units: PERCENT

Analysis Method: 160.3M

Basis: Wet

Test Notes:

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
HC-BS01-C1	K9908537-001	12/1/99	77.1	
HC-BS01-BARGE-C1	K9908537-006	12/1/99	82.7	
HC-BS03-C1	K9908537-010	12/1/99	55.5	

Approved By:

*LJ*

Date: 12/20/99

00004

TSOLIDS.XLT\_Sample01071998a

08537ICP.AB1 - 010 12/20/99

Page No.:

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

lient: Hart Crowser, Inc.  
roject: POP Terminal 5/5930  
ample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

## Solids, Total Volatile

rep Method: NONE Units: PERCENT  
nalysis Method: 160.4M Basis: DRY  
est Notes:

ample Name	Lab Code	Date Analyzed	Result	Result Notes
IC-BS01-C1	K9908537-001	12/16/99	1.72	
IC-BS01-BARGE-C1	K9908537-006	12/16/99	1.14	
IC-BS03-C1	K9908537-010	12/16/99	6.27	

Approved By: lcy Date: 12/29/99

00005

Total Solids/060595

08537ICP.AB1 - TVS 12/20/99

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Inorganic Parameters

Sample Name: HC-BS01-C1 Basis: Dry  
Lab Code: K9908537-001  
Test Notes:

Analyst	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Amonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	12/13/99	56.2	
Hfide, Total	mg/Kg (ppm)	PSEP	0.9	0.9	1	NA	12/4/99	ND	
ron, Total Organic	PERCENT	PSEP	0.05	0.006	1	NA	12/13/99	0.11	

Modified

Approved By: MMR  
2020597p

Date: 12/13/99

00006

Page No..

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient: Hart Crowser, Inc.  
object: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Inorganic Parameters

mple Name: HC-BS01-BARGE-C1 Basis: Dry  
b Code: K9908537-006

st Notes:

alyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Nitrogen as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	12/13/99	6.67	
Hydrogen Total	mg/Kg (ppm)	PSEP	0.9	0.9	1	NA	12/4/99	ND	
Carbon Total Organic	PERCENT	PSEP	0.05	0.006	1	NA	12/13/99	0.05	

Modified

Approved By: MMK

2020597p

Date: 12/13/99

00007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Inorganic Parameters

Sample Name: HC-BS03-C1 Basis: Dry  
Lab Code: K9908537-010  
First Notes:

Analyst	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Nitrogen as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	12/13/99	142	
Chloride, Total	mg/Kg (ppm)	PSEP	0.9	0.9	1	NA	12/4/99	30	
Carbon, Total Organic	PERCENT	PSEP	0.05	0.006	1	NA	12/13/99	1.48	

Modified

Approved By: MMK Date: 12/13/99 00008  
2/020597p

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

ient: Hart Crowser, Inc.  
ject: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA

Inorganic Parameters

mple Name: Method Blank Basis: Dry  
b Code: K9908537-MB  
st Notes:

alyte	Units	Analysis Method	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
monia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	0.2	1	NA	12/13/99	ND	
lride, Total	mg/Kg (ppm)	PSEP	0.9	0.9	1	NA	12/4/99	ND	
rbon, Total Organic	PERCENT	PSEP	0.05	0.006	1	NA	12/13/99	ND	

Modified

pproved By: MMK

12-020597p

Date: 12/13/99

00009

Columbia Analytical Services, Inc

TOTAL METALS

- Cover Page -

INORGANIC ANALYSIS DATA PACKAGE

Contract: Hart Crowser, Inc.

SDG No.: K9908537

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

Job No.: SW846

Sample No.

HC-BS01-C1  
HC-BS01-C1D  
HC-BS01-C1S  
HC-BS01-BARGE-C1  
HC-BS01-BARGE-C1D  
HC-BS01-BARGE-C1S  
HC-BS03-C1

Lab Sample ID.

K9908537-001  
K9908537-001D  
K9908537-001S  
K9908537-006  
K9908537-006D  
K9908537-006S  
K9908537-010

Were ICP interelement corrections applied?

Yes/No YES

Were ICP background corrections applied?

Yes/No YES

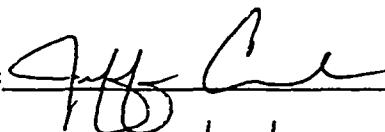
If yes-were raw data generated before application of background corrections?

Yes/No NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature:



Name:



Date:



Title:



**Columbia Analytical Services, Inc****TOTAL METALS****-1-****INORGANIC ANALYSIS DATA SHEET****SAMPLE NO.****HC-BS01-C1**

Extract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.: SDG No.: K9908537

Matrix (soil/water): SEDIMENT

Lab Sample ID: K9908537-001

Rel (low/med): LOW

Date Received: 11/29/99

Solids: 77.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.09			MS
7440-38-2	Arsenic	3.7			MS
7440-43-9	Cadmium	0.18			MS
7440-47-3	Chromium	11.0			MS
7440-50-8	Copper	14.8			MS
7439-92-1	Lead	4.65			MS
7439-97-6	Mercury	0.01	B		CV
7440-02-0	Nickel	14.8			MS
7440-22-4	Silver	0.06			MS
7440-66-6	Zinc	65.8			MS

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments: \_\_\_\_\_

00011

## TOTAL METALS

-1-

## INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

HC-BS01-BARGE-C1

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06 SAS No.: SDG NO.: K9908537

Matrix (soil/water): SEDIMENT

Lab Sample ID: K9908537-006

Level (low/med): LOW

Date Received: 11/29/99

Solids: 82.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.06			MS
7440-38-2	Arsenic	2.0			MS
7440-43-9	Cadmium	0.08			MS
7440-47-3	Chromium	7.5			MS
7440-50-8	Copper	8.31			MS
7439-92-1	Lead	3.21			MS
7439-97-6	Mercury	0.02	B		CV
7440-02-0	Nickel	11.7			MS
7440-22-4	Silver	0.04			MS
7440-66-6	Zinc	34.2			MS

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments: \_\_\_\_\_

00012

**Columbia Analytical Services, Inc****TOTAL METALS****-1-****INORGANIC ANALYSIS DATA SHEET****SAMPLE NO.****HC-BS03-C1**TRACT: Hart Crowser, Inc.Code: KLAB Case No.: 5792-06 SAS No.:  SDG No.: K9908537Matrix (soil/water): SEDIMENT Lab Sample ID: K9908537-010Level (low/med): LOW Date Received: 11/29/99Solids: 55.5

Concentration Units (ug/L or mg/kg dry weight): MG/KG

CAS No.	Analyte	Concentration	C	Q	M
7440-36-0	Antimony	0.18			MS
7440-38-2	Arsenic	5.1			MS
7440-43-9	Cadmium	0.67			MS
7440-47-3	Chromium	24.9			MS
7440-50-8	Copper	37.9			MS
7439-92-1	Lead	16.5			MS
7439-97-6	Mercury	0.05			CV
7440-02-0	Nickel	23.2			MS
7440-22-4	Silver	0.24			MS
7440-66-6	Zinc	122			MS

Color Before:

Clarity Before:

Texture:

Color After:

Clarity After:

Artifacts:

Comments: \_\_\_\_\_

00013

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal S/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 12/1/99

Butyltins in Porewater

Sample Name: HC-BS01-C1 Units: ug/L (ppb)  
Lab Code: K9908537-001 Basis: NA  
Test Notes: X

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.02	1	12/2/99	12/7/99	3.5	
Di-n-butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	0.34	
n-Butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	0.22	

X

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

Approved By:

1S22/020597p

08537SVGAY1 - 1 12/13/99

Date: 12-13-99

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Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 12/1/99

Butyltins in Porewater

Sample Name: HC-BS01-BARGE-C1 Units: ug/L (ppb)  
Lab Code: K9908537-006 Basis: NA  
Test Notes: X

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.02	1	12/2/99	12/7/99	0.08	
Di-n-butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	0.10	
n-Butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	0.09	

X Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

Approved By:

1S22/020597p

Date: 12-13-99

08537SVG.AY1 - 6 12/13/99

00015  
Page No.: 1

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 12/1/99

Butyltins in Porewater

Sample Name: HC-BS03-C1 Units: ug/L (ppb)  
Lab Code: K9908537-010 Basis: NA  
Test Notes: X

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.02	1	12/2/99	12/7/99	0.03	
Di-n-butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
n-Butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	

X Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

Approved By:

LS22/020597p

Date: 12-13-99

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537

Date Collected: NA

Date Received: NA

Date Porewater Extracted: 12/1/99

## Butyltins in Porewater

Sample Name: Method Blank Units: ug/L (ppb)  
Lab Code: KWG9904302-3 Basis: NA  
Test Notes: X

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.02	1	12/2/99	12/7/99	ND	
Di-n-butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	
n-Butyltin Cation	EPA 3520C	Krone	0.05	1	12/2/99	12/7/99	ND	

X Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

Approved By:

1S22/020597p

Date: 12-12-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Organochlorine Pesticides

Sample Name: HC-BS01-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-001 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
gamma-BHC (Lindane)	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Aldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
gamma-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
alpha-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Dieldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
,4'-DDE	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
4,4'-DDD	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
4,4'-DDT	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	

Approved By:

522/020597p

Date: 12-13-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Organochlorine Pesticides

Sample Name: HC-BS01-BARGE-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-006 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
gamma-BHC (Lindane)	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Aldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
gamma-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
alpha-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Dieldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
1,4'-DDE	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
1,4'-DDD	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
1,4'-DDT	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	

Approved By:

SZ2/020597p

Date: 12/13/99

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K9908537  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99

## Organochlorine Pesticides

**Sample Name:** HC-BS03-C1                            **Units:** ug/Kg (ppb)  
**Lab Code:** K9908537-010                            **Basis:** Dry  
**Test Notes:**

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
gamma-BHC (Lindane)	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Aldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
gamma-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
alpha-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Dieldrin	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
4,4'-DDE	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
4,4'-DDD	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
4,4'-DDT	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	

Approved By: \_\_\_\_\_

IS22/020597p

Date: 12.13.99

00020

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA

## Organochlorine Pesticides

Sample Name: Method Blank Units: ug/Kg (ppb)  
Lab Code: KWG9904313-3 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
gamma-BHC (Lindane)	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
alpha-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
beta-Chlordane	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
Heptachlor	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
,4'-DDE	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
,4'-DDD	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	
,4'-DDT	EPA 3540C	8081A	5	1	12/3/99	12/10/99	ND	

Approved By: Jay  
022020597p

Date: 12-15-99

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Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Polychlorinated Biphenyls (PCBs)

Sample Name: HC-BS01-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-001 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Notes
Aroclor 1016	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	12/3/99	12/11/99	ND	
Aroclor 1232	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1242	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1248	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1254	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1260	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	

Approved By:

1S22020597p

Date: 12.18.99

00022

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Polychlorinated Biphenyls (PCBs)

Sample Name: HC-BS01-BARGE-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-006 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	12/3/99	12/11/99	ND	
Aroclor 1232	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1242	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1248	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1254	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1260	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	

Approved By: \_\_\_\_\_

1S22/020597p

Date: 12-13-99

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Polychlorinated Biphenyls (PCBs)

Sample Name: HC-BS03-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-010 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	12/3/99	12/11/99	ND	
Aroclor 1232	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1242	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1248	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1254	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1260	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	

Approved By:

IS22/020597p

Date: 12-13-99

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA

Polychlorinated Biphenyls (PCBs)

Sample Name: Method Blank Units: ug/Kg (ppb)  
Lab Code: KWG9904313-4 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Aroclor 1016	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1221	EPA 3540C	8082	20	1	12/3/99	12/11/99	ND	
Aroclor 1232	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1242	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1248	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1254	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	
Aroclor 1260	EPA 3540C	8082	10	1	12/3/99	12/11/99	ND	

Approved By: Jes Date: 12-13-99

1522/020597p

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Page No.:

## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99

## Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: HC-BS01-C1 Units: ug/Kg (ppb)  
 Lab Code: K9908537-001 Basis: Dry  
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,3-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,4-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,2-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
Benzyl Alcohol	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
2-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
4-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2,4-Dimethylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,2,4-Trichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Naphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzoic Acid	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
Hexachlorobutadiene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Acenaphthylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dimethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Acenaphthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenzofuran	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Fluorene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Diethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
N-Nitrosodiphenylamine	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Hexachlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Pentachlorophenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Phenanthrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	13	
Anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Di-n-butyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Fluoranthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	18	
Pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	15	
Butyl Benzyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benz(a)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	6	
Chrysene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	9	
Bis(2-ethylhexyl) Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Di-n-octyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	8	
Benzo(k)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	7	
Benzo(a)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	7	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenz(a,h)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Hexachloroethane	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	

## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client:  
Project:  
Sample Matrix:

Hart Crowser, Inc.  
POP-Terminal 5/5930  
Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

## Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: HC-BS01-BARGE-C1 Units: ug/Kg (ppb)  
Lab Code: K9908537-006 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,3-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,4-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,2-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
Benzyl Alcohol	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
2-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
4-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2,4-Dimethylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,2,4-Trichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Naphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzoic Acid	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
Hexachlorobutadiene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Acenaphthylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dimethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Acenaphthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenzofuran	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Fluorene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Diethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
N-Nitrosodiphenylamine	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Hexachlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Pentachlorophenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Phenanthrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Di-n-butyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Fluoranthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Butyl Benzyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benz(a)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Chrysene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Di-n-octyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Benzo(k)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Benzo(a)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenz(a,h)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Hexachloroethane	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	

## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99

## Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: HC-BS03-C1 Units: ug/Kg (ppb)  
 Lab Code: K9908537-010 Basis: Dry  
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
1,3-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,4-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,2-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
Benzyl Alcohol	EPA 3550B	SIM	50	1	12/1/99	12/6/99	ND	
2-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
4-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
2,4-Dimethylphenol	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
1,2,4-Trichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
Naphthalene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	ND	
Benzoic Acid	EPA 3550B	SIM	50	1	12/1/99	12/6/99	ND	
Hexachlorobutadiene	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	ND	
Acenaphthylene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	ND	
Dimethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	ND	
Acenaphthene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	7	
Dibenzofuran	EPA 3550B	SIM	6	1	12/1/99	12/6/99	ND	
Fluorene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	ND	
Diethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	ND	
N-Nitrosodiphenylamine	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
Hexachlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
Pentachlorophenol	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	
Phenanthrene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	36	
Anthracene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	8	
Di-n-butyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	ND	
Fluoranthene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	65	
Pyrene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	71	
Butyl Benzyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	ND	
Benz(a)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	33	
Chrysene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	43	
Bis(2-ethylhexyl) Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	97	
Di-n-octyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/6/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/6/99	38	
Benzo(k)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/6/99	31	
Benzo(a)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	43	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	34	
Dibenz(a,h)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	6	
Benzo(g,h,i)perylene	EPA 3550B	SIM	6	1	12/1/99	12/6/99	36	
Hexachloroethane	EPA 3550B	SIM	10	1	12/1/99	12/6/99	ND	

Approved By:  
08537SVMAYI-10121799

(H. H. Lee)

Date: DEC 17 1999  
Page No. 00028

## COLUMBIA ANALYTICAL SERVICES, INC.

## Analytical Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: NA  
 Date Received: NA

## Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: Method Blank Units: ug/Kg (ppb)  
 Lab Code: KWG9904280-8 Basis: NA  
 Test Notes:

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Phenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,3-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,4-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
1,2-Dichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/16/99	ND	
Benzyl Alcohol	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
2-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
4-Methylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2,4-Dimethylphenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
1,2,4-Trichlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Naphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzoic Acid	EPA 3550B	SIM	50	1	12/1/99	12/4/99	ND	
Hexachlorobutadiene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
2-Methylnaphthalene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Acenaphthylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dimethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Acenaphthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenzofuran	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Fluorene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Diethyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
N-Nitrosodiphenylamine	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Hexachlorobenzene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Pentachlorophenol	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Phenanthrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Di-n-butyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Fluoranthene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Butyl Benzyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benz(a)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Chrysene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Bis(2-ethylhexyl) Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Di-n-octyl Phthalate	EPA 3550B	SIM	35	1	12/1/99	12/4/99	ND	
Benzo(b)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Benzo(k)fluoranthene	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	
Benzo(a)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Indeno(1,2,3-cd)pyrene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Dibenzo(a,h)anthracene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Benzo(g,h,i)perylene	EPA 3550B	SIM	6	1	12/1/99	12/4/99	ND	
Hexachloroethane	EPA 3550B	SIM	10	1	12/1/99	12/4/99	ND	

Approved By: Hart Crowser, Inc.  
 085375VMAY1 MB 12/17/99

(Hart Crowser)

Date: DEC 17 1999

Page No.: 00029

**APPENDIX A**

**LABORATORY**

**QC RESULTS**

00030

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

**Client:** Hart Crowser, Int.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K9908537  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99

## Duplicate Summary

### Total Solids

Prep Method: NONE Units: PERCENT  
Analysis Method: 160.3M Basis: Wet  
Test Notes:

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate		Relative Percent Difference	Result Notes
				Sample Result	Average		
IC-BS01-C1	K9908537-001DUP	12/1/99	77.1	77.7	77.4	<1	

Approved By: by Date: 12/20/17

TSOLID.SXLT\_DUP/09291993a

Date: (2/20/?)

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Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99

Duplicate Summary  
Solids, Total Volatile

Prep Method: NONE

Units: PERCENT

Analysis Method: 160.4M

Basis: WET

Test Notes:

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
IC-BS01-C1	K9908537-001DUP	12/16/99	1.72	1.79	1.76	<1	

Approved By: LM

Date: 12/24/99

00032

total Solids/060593

08537ICP AB1 - TVS DUP 12/20/99

Page No.:

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

ent: Hart Crowser, Inc.  
 ject: POP-Terminal 5/5930  
 ample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99  
 Date Extracted: NA  
 Date Analyzed: 12/1-13/99

Duplicate Summary  
Inorganic Parameters

Sample Name: HC-BS01-C1 Basis: Dry  
 Sample Code: K9908537-001DUP  
 Sample Notes:

Analyte	Units	Analysis Method	MRL	Sample Result	Duplicate	Relative Percent Difference	Result Notes
					Sample Result		
Nitrogen as Nitrogen	mg/Kg (ppm)	PSEP	350.1M	0.2	56.2	56.9	56.6
Total Nitrogen	mg/Kg (ppm)	PSEP	0.9	ND	ND	ND	-
Total Organic Carbon	PERCENT	PSEP	0.05	0.11	0.12	0.12	5

Approved By: MMRDate: 12/13/99

05557WET.LJ1 - DUP 12/13/99

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## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99  
 Date Extracted: NA  
 Date Analyzed: 12/1-13/99

Matrix Spike Summary  
 Inorganic Parameters

Sample Name: HC-BS01-C1  
 Job Code: K9908537-001MS  
 Test Notes:

Basis: Dry

Analyte	Units	Analysis Method	MRL	Spike Level	Sample Result	Spiked	Percent Recovery	Acceptance Limits	CAS Percent Recovery	Result Notes
						Sample Result			Recovery	
Ammonia as Nitrogen	mg/Kg (ppm)	350.1M	0.2	1260	56.2	1350	103	75-125		
Sulfide, Total	mg/Kg (ppm)	PSEP	0.9	274	ND	216	79	60-130		
Carbon, Total Organic	PERCENT	PSEP	0.05	0.93	0.11	1.11	107	85-115		

Approved By: LMM/LDate: 12/13/9900034  
Page No.: 1

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

Ent: Hart Crowser, Inc.  
 ject: POP-Terminal 5/5930  
 S Matrix: Sediment

Service Request: K9908537  
 Date Collected: NA  
 Date Received: NA  
 Date Extracted: NA  
 Date Analyzed: 12/13/99

Laboratory Control Sample Summary  
 Inorganic Parameters

Sample Name:	Lab Control Sample	Basis: Dry						
Code:	K9908537-LCS							
Notes:								
Analyte	Units	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery	Acceptance Limits	Result Notes
Nitrogen as Nitrogen	mg/Kg (ppm)	350.1M	2.87	2.73	95	85-115		
Total Nitrogen	mg/Kg (ppm)	PSEP	0.90	0.85	94	60-130		
Total Organic Carbon	PERCENT	PSEP	1.16	1.05	90	85-115		

proved By: MMR

072808P08537WET.LJ1 - LCS 12/13/99

Date: 12/13/99

00035

Page No.:

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930

Service Request: K9908537  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 12/8/99

Ammonia as Nitrogen  
EPA Method 350.1 Modified  
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	2.00	2.03	102
CCV 2 Result	2.00	2.00	100
CCV 3 Result	2.00	2.00	100

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND
CCB 3 Result	0.05	ND

Approved By: MMR  
COMBOQCD/042695

Date: 12/13/99

00036

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930

**Service Request:** K9908537  
**Date Collected:** NA  
**Date Received:** NA  
**Date Analyzed:** 12/1/99

Sulfide, Total  
PSEP  
Units: mg/L (ppm)

**CONTINUING CALIBRATION VERIFICATION (CCV)**

	True Value	Measured Value	Percent Recovery
CCV 1 Result	0.44	0.45	102
CCV 2 Result	0.44	0.45	102

**CONTINUING CALIBRATION BLANK (CCB)**

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: MMR  
COMBOQCD/042695

Date: 12/13/99

00037

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930

Service Request: K9908537  
Date Collected: NA  
Date Received: NA  
Date Analyzed: 12/13/99

Carbon, Total Organic  
PSEP  
Units: mg/L (ppm)

CONTINUING CALIBRATION VERIFICATION (CCV)

	True Value	Measured Value	Percent Recovery
CCV 1 Result	20.0	19.0	95
CCV 2 Result	20.0	19.1	96

CONTINUING CALIBRATION BLANK (CCB)

	MRL	Blank Value
CCB 1 Result	0.05	ND
CCB 2 Result	0.05	ND

Approved By: MMR  
COMBOQCD/042695

Date: 12/13/99

00038

*lumbia Analytical Services, Inc*

**TOTAL METALS**

- 2a -

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

stract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Initial Calibration Source: Inorganic Ventures

Continuing Calibration Source: CAS CCV

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration					M
	True	Found	%R(1)	True	Found	%R(1)	Found	%R(1)	
Antimony	50	52.4	105	25	26.0	104	25.0	100	MS
Arsenic	50	50.3	101	25	25.2	101	25.4	102	MS
Chromium	25	25.0	100	25	25.0	100	24.9	100	MS
Copper	20	20.1	101	25	24.9	100	24.8	99	MS
Lead	50	50.1	100	25	25.0	100	24.4	98	MS
Merkury	5.0	5.10	102	5.0	5.00	100	4.92	98	CV
Nickel	50	50.2	100	25	25.0	100	25.0	100	MS
Silver	25	24.7	99	25	25.1	100	25.2	101	MS
Zinc	50	50.8	102	25	25.2	101	25.0	100	MS

00039

## TOTAL METALS

- 2a -

## INITIAL AND CONTINUING CALIBRATION VERIFICATION

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Initial Calibration Source:

Continuing Calibration Source: CAS CCV

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M
	True	Found	%R(1)	True	Found	%R(1)	Found	
Antimony				25	25.0	100		MS
Arsenic				25	25.8	103		MS
Cadmium				25	24.9	100		MS
Chromium				25	24.9	100		MS
Copper				25	25.5	102		MS
Lead				25	25.7	103		MS
Mercury				5.0	4.98	100	5.13	103 CV
Nickel				25	25.2	101		MS
Silver				25	24.7	99		MS
Zinc				25	25.5	102		MS

00040

*umbia Analytical Services, Inc*

**TOTAL METALS**

- 2a -

**INITIAL AND CONTINUING CALIBRATION VERIFICATION**

tract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

tial Calibration Source:

tinuing Calibration Source: CAS CCV

Concentration Units: ug/L

Analyte	Initial Calibration			Continuing Calibration				M
	True	Found	%R(1)	True	Found	%R(1)	Found	
Mercury				5.0	5.10	102		CV

## TOTAL METALS

-2b-

## CRDL STANDARD FOR AA AND ICP

Contract: Hart Crowser, Inc.

Case Code: KLAB Case No.: 5792-06 SAS No.:

SDG No.: K9908537

CRDL Standard Source:

P CRDL Standard Source: ICP Std Source

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP			
	True	Found	%R	Initial	True	Found	%R
Antimony					1.0	1.09	109
Arsenic					1.0	1.04	104
Cadmium					1.0	1.04	104
Chromium					1.0	1.04	104
Copper					1.0	1.10	110
Lead					1.0	1.04	104
Mercury	0.20	0.15	75				
Nickel					1.0	1.09	109
Silver					1.0	0.98	98
Zinc					1.0	1.07	107

00042

*lumbia Analytical Services, Inc*

**TOTAL METALS**

- 3 -

**BLANKS**

tract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Preparation Blank Matrix (soil/water): SOIL

Preparation Blank Concentration Units (ug/L or mg/kg): MG/KG

Analyte	Initial Calib. Blank (ug/L)	Continuing Calibration Blank (ug/L)						Preparation Blank	
		C	1	C	2	C	3	C	M
Antimony							0.04	U	0.02 U MS
Arsenic							0.4	U	0.2 U MS
Cadmium							0.04	U	0.02 U MS
Chromium							0.1	U	0.07 B MS
Copper							0.06	U	0.03 U MS
Lead							0.04	U	0.02 U MS
Mercury							0.10	U	0.01 U CV
Nickel							0.4	U	0.2 U MS
Silver							0.01	U	0.01 U MS
Zinc							0.4	U	0.5 B MS

00043

*Columbia Analytical Services, Inc*

**TOTAL METALS**

- 3 -

**BLANKS**

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M
		1	C	2	C	3	C			
Antimony		0.04	U	0.04	U					MS
Arsenic		0.4	U	0.4	U					MS
Cadmium		0.04	U	0.04	U					MS
Chromium		0.1	U	0.1	U					MS
Copper		0.06	U	0.06	U					MS
Lead		0.04	U	0.04	U					MS
Mercury		-0.11	B	-0.11	B	0.10	U			CV
Nickel		0.4	U	0.4	U					MS
Silver		0.01	U	0.01	U					MS
Zinc		0.4	U	0.4	U					MS

00044

*lumbia Analytical Services, Inc*

**TOTAL METALS**

- 3 -

**BLANKS**

Contract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Separation Blank Matrix (soil/water): WATER

Separation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L)						Preparation Blank	C	M	
			1	C	2	C	3	C				
Mercury			0.10	U								cv

00045

*Columbia Analytical Services, Inc*

**TOTAL METALS**

-4-

**ICP INTERFERENCE CHECK SAMPLE**

Contract: Hart Crowser, Inc.

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

ICP ID Number: VG ICPMS

ICS Source: ICS Source

Concentration Units): ug/L

Analyte	True		Initial Found			Final Found		
	Sol.A	Sol.AB	Sol.A	Sol.AB	%R	Sol.A	Sol.AB	%R
Antimony			0.14	0.14				
Arsenic		20	0.0	19.6	98			
Cadmium		20	0.38	19.5	98			
Chromium		20	0.13	19.3	97			
Copper		20	0.44	19.4	97			
Lead			0.11	0.08				
Nickel		20	0.36	19.4	97			
Silver		20	0.01	18.3	92			
Zinc		20	0.89	20.4	102			

00046

*lumbia Analytical Services, Inc*

**TOTAL METALS**

-5a-

**SPIKE SAMPLE RECOVERY**

SAMPLE NO.

HC-BS01-BARGE-C1S

tract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

atrix (soil/water): SEDIMENT

Level (low/med): LOW

solids for Sample: 82.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Antimony	60 - 130	91.8		0.06		121	76	MS	
Arsenic	60 - 130	48.3		2.0		48.4	96	MS	
Cadmium	60 - 130	11.8		0.08		12.1	97	MS	
Chromium	60 - 130	52.3		7.5		48.4	92	MS	
Copper	60 - 130	63.9		8.31		60.5	92	MS	
Lead	60 - 130	121		3.21		121	97	MS	
Nickel	60 - 130	120		11.7		121	90	MS	
Silver	60 - 130	12.3		0.04		12.1	101	MS	
Zinc	60 - 130	144		34.2		121	91	MS	

ments:

00047

Columbia Analytical Services, Inc

TOTAL METALS

-5a-

SPIKE SAMPLE RECOVERY

SAMPLE NO.

HC-BS01-C1S

Contract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Matrix (soil/water): SEDIMENT

Level (low/med): LOW

Solids for Sample: 77.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Mercury	60 - 130	0.48		0.01  B		0.46	101		CV

Comments:

00048

**Columbia Analytical Services, Inc****TOTAL METALS****- 5b -****POST DIGEST SPIKE SAMPLE RECOVERY**

SAMPLE NO.

HC-BS01-BARGE-C1A

Contract: Hart Crowser, Inc.

b Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

matrix (soil/water): SEDIMENT

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Control Limit %R	Spiked Sample Result (SSR)	C	Sample Result (SR)	C	Spike Added (SA)	%R	Q	M
Antimony		51.0		0.10		50.0	102	MS	
Arsenic		50.8		3.33		50.0	95	MS	
Cadmium		48.8		0.14		50.0	97	MS	
Chromium		58.6		12.5		50.0	92	MS	
Copper		59.1		13.7		50.0	91	MS	
Lead		54.1		5.31		50.0	98	MS	
Nickel		65.9		19.4		50.0	93	MS	
Silver		48.2		0.06		50.0	96	MS	
Zinc		103		56.5		50.0	93	MS	

Comments: \_\_\_\_\_

00049

SW-846

**Columbia Analytical Services, Inc****TOTAL METALS****-6-****DUPLICATES**

SAMPLE NO.

HC-BS01-BARGE-C1

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Matrix (soil/water): SEDIMENT

Level (low/med): LOW

Solids for Sample: 82.7

Solids for Duplicate: 82.7

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RFD	Q	M
Antimony	0.0		0.06		0.06	8		MS
Arsenic	0.6		2.0		2.0	3		MS
Cadmium	0.0		0.08		0.08	0		MS
Chromium			7.5		8.1	7		MS
Copper			8.31		8.79	6		MS
Lead			3.21		3.25	1		MS
Nickel			11.7		11.7	0		MS
Silver	0.0		0.04		0.04	6		MS
Zinc			34.2		35.4	3		MS

00050

Columbia Analytical Services, Inc

**TOTAL METALS**

- 6 -

**DUPPLICATES**

SAMPLE NO.

HC-BS01-C1D

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06 SAS No.:

SDG NO.: K9908537

Matrix (soil/water): SEDIMENT

Level (low/med): LOW

Solids for Sample: 77.1

% Solids for Duplicate: 77.1

Concentration Units (ug/L or mg/kg dry weight): MG/KG

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Mercury			0.01   B		0.01   B	24		CV

00051  
SW-846

## TOTAL METALS

-7-

## LABORATORY CONTROL SAMPLE

Contract: Hart Crowser, Inc.

Job Code: KLAB Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

Aqueous LCS Source: ERA Lot # 238

Aqueous LCS Source: Inorganic Ventures

Analyte	Aqueous mg/L			Solid (mg/kg)				Limits	%R
	True	Found	%R	True	Found	C			
Antimony				59.6	74.5		12.0	107	125
Arsenic				82.4	76.9		50.9	114	93
Cadmium				94.3	79.7		52.1	136	85
Chromium				97.8	83.8		67.8	128	86
Copper				81.3	70.7		50.0	113	87
Lead				190	165		114	267	87
Mercury				1.34	1.23		0.662	2.02	92
Nickel				164	136		110	218	83
Silver				131	137		74.1	188	105
Zinc				103	91.5		62.7	142	89

Columbia Analytical Services, Inc

TOTAL METALS

-9-

ICP SERIAL DILUTIONS

SAMPLE NO.

HC-BS01-BARGE-C1L

Contract: Hart Crowser, Inc.

Lab Code: KLAB Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

Matrix (soil/water): SEDIMENT

Level (low/med): LOW

Concentration Units: ug/L

Analyte	Initial Sample Result (I)		Serial Dilution Result (S)		% Difference	Q	M
	C		C				
Antimony	0.10		0.20	U			MS
Arsenic	3.33		3.59	B	8		MS
Cadmium	0.14		0.23		70		MS
Chromium	12.5		13.0		4		MS
Copper	13.7		15.0		9		MS
Lead	5.31		5.46		3		MS
Nickel	19.4		21.2		9		MS
Silver	0.06		0.05	U			MS
Zinc	56.5		63.6		13	E	MS

*Columbia Analytical Services, Inc*

**TOTAL METALS**

-10-

**METHOD DETECTION LIMITS**

Contract: Hart Crowser, Inc.

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

DP ID Number:

Date: 07/15/99

Name AA ID Number: Varian-3

Reference AA ID Number:

Analyte	Wave-length	Back-ground	MRL (ug/L)	MDL (ug/L)	M
Mercury	253.70	BD	0.20	0.10	CV

Comments

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00054

SW-846

## TOTAL METALS

-10-

## METHOD DETECTION LIMITS

ntract: Hart Crowser, Inc.Code: KLAB Case No.: 5792-06 SAS No.:  SDG NO.: K9908537P ID Number: VG ICPMS Date: 07/15/99

ume AA ID Number:

nace AA ID Number:

Analyte	Mass	Back-ground	MRL (ug/L)	MDL (ug/L)	M
Antimony	123		0.04	0.04	MS
Arsenic	75		1.0	0.4	MS
Cadmium	111		0.04	0.04	MS
Chromium	52		0.4	0.1	MS
Copper	65		0.40	0.06	MS
Lead	208		0.40	0.04	MS
Nickel	60		0.4	0.4	MS
Silver	107		0.04	0.01	MS
Zinc	66		1.0	0.4	MS

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*Columbia Analytical Services, Inc*

**TOTAL METALS**

-12-

**ICP LINEAR RANGES (QUARTERLY)**

Contract: Hart Crowser, Inc.

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

ICP ID Number: VG ICPMS

Date: 07/15/99

Analyte	Integ. Time (Sec.)	Concentration (ug/L)	M
Antimony	15.00	1000.0	MS
Arsenic	15.00	1000.0	MS
Cadmium	15.00	1000.0	MS
Chromium	15.00	200.0	MS
Copper	15.00	1000.0	MS
Lead	15.00	1000.0	MS
Nickel	15.00	1000.0	MS
Silver	15.00	400.0	MS
Zinc	15.00	1000.0	MS

Comments: \_\_\_\_\_

00056  
SW-846

**TOTAL METALS**  
**- 13 -**  
**PREPARATION LOG**

ntract: Hart Crowser, Inc.

Code: KLAB

Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

ethod CV

Sample No.	Preparation Date	Weight (grams)	Volume (mL)
K9908537-006	12/3/99	1.33	100
K9908537-001	12/3/99	1.38	100
K9908537-001D	12/3/99	1.35	100
K9908537-001S	12/3/99	1.41	100
K9908537-010	12/3/99	1.99	100
ICV	12/3/99		100
LCSS	12/3/99	0.67	100
PBS	12/3/99	1.00	100
S0	12/3/99		100
S0.2	12/3/99		100
S0.5	12/3/99		100
S1	12/3/99		100
S5	12/3/99		100
S10	12/3/99		100

00057

Columbia Analytical Services, Inc

TOTAL METALS

-13-

PREPARATION LOG

Contract: Hart Crowser, Inc.

Code: KLAB

Case No.: 5792-06

SAS No.:

SDG NO.: K9908537

Method MS

Sample No.	Preparation Date	Weight (grams)	Volume (mL)
K9908537-006	12/2/99	1.00	100
K9908537-006D	12/2/99	1.00	100
K9908537-006S	12/2/99	1.00	100
K9908537-001	12/2/99	1.00	100
K9908537-010	12/2/99	2.00	100
LCSS	12/2/99	1.00	100
PBS	12/2/99	1.00	100

00058

*lumbia Analytical Services, Inc*

**TOTAL METALS**  
- 13 -  
**PREPARATION LOG**

tract: Hart Crowser, Inc.

Code: KLAB Case No.: 5792-06 SAS No.: \_\_\_\_\_ SDG NO.: K9908537

Method MS

Sample No.	Preparation Date	Weight (grams)	Volume (mL)
K9908537-006	12/2/99	1.00	100
K9908537-006D	12/2/99	1.00	100
K9908537-006S	12/2/99	1.00	100
K9908537-001	12/2/99	1.00	100
K9908537-010	12/2/99	2.00	100
LCSS	12/2/99	1.00	100
PBS	12/2/99	1.00	100

## Columbia Analytical Services, Inc

## TOTAL METALS

-14-

## ANALYSIS RUN LOG

Contract Hart Crowser, Inc.

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

SDG No.: K9908537

Instrument ID Number: Varian-3

Method: CV

Start Date: 12/6/99

End Date: 12/6/99

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K S	S A	N G	T E	V G	Z C L
S0	1.00	18:30																			X				
S0.2	1.00	18:31																			X				
S0.5	1.00	18:32																			X				
S1	1.00	18:33																			X				
S5	1.00	18:34																			X				
S10	1.00	18:35																			X				
ICV	1.00	18:36																			X				
CCV	1.00	18:37																			X				
CCB	1.00	18:38																			X				
CRI	1.00	18:39																			X				
PBS	1.00	18:40																			X				
LCSS	1.00	18:41																			X				
ZZZZZZ	1.00	18:42																							
ZZZZZZ	1.00	18:43																							
ZZZZZZ	1.00	18:44																							
ZZZZZZ	1.00	18:45																							
ZZZZZZ	1.00	18:46																							
ZZZZZZ	1.00	18:47																							
ZZZZZZ	1.00	18:48																							
CCV	1.00	18:49																			X				
CCB	1.00	18:50																			X				
ZZZZZZ	1.00	18:51																							
ZZZZZZ	1.00	18:52																							
ZZZZZZ	1.00	18:53																							
ZZZZZZ	1.00	18:54																							
ZZZZZZ	1.00	18:55																							
ZZZZZZ	1.00	18:56																							
ZZZZZZ	1.00	18:57																							
ZZZZZZ	1.00	18:58																							
ZZZZZZ	1.00	18:59																							
ZZZZZZ	1.00	19:00																							
ZZZZZZ	1.00	19:01																							
CCV	1.00	19:02																			X				
CCB	1.00	19:03																			X				

\* - Denotes additional elements (other than the standard elements) are represented on another Form 14

Form XIV - IN

00060  
SW-846

## lumbia Analytical Services, Inc

## TOTAL METALS

- 14 -

## ANALYSIS RUN LOG

ntract Hart Crowser, Inc.

b Code: KLAB Case No.: 5792-06 SAS No.:  SDG No.: K9908537  
 strument ID Number: Varian-3 Method: CV  
 art Date: 12/6/99 End Date: 12/6/99

Sample No.	D/F	Time	% R	Analytes																			
				A L	S B	S A	B E	B A	C D	C A	C R	C O	F U	P B	M G	M N	H G	N I	K S	S E	A G	N A	T G
ZZZZZ	1.00	19:04																					
ZZZZZ	1.00	19:05																					
ZZZZZ	1.00	19:06																					
ZZZZZ	1.00	19:07																					
ZZZZZ	1.00	19:08																					
ZZZZZ	1.00	19:09																					
ZZZZZ	1.00	19:10																					
ZZZZZ	1.00	19:11																					
ZZZZZ	1.00	19:12																					
ZZZZZ	1.00	19:13																					
ZZZZZ	1.00	19:14																					
CV	1.00	19:15																x					
CB	1.00	19:16															x						
9908537-001	1.00	19:17															x						
9908537-001D	1.00	19:18															x						
9908537-001S	1.00	19:19															x						
9908537-006	1.00	19:20															x						
9908537-010	1.00	19:21															x						
CV	1.00	19:22															x						
CB	1.00	19:23															x						

- Denotes additional elements (other than the standard elements) are represented on another Form 14

Form XIV - IN

00061

SW-846

## Polumbia Analytical Services, Inc

## TOTAL METALS

-14-

## ANALYSIS RUN LOG

Contract Hart Crowser, Inc.

Lab Code: KLAB

Case No.: 5792-06

SAS No.:

SDG No.: K9908537

Instrument ID Number: VG ICPMS

Method: MS

Start Date: 12/3/99

End Date: 12/3/99

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	F U	P B	M G	M N	H G	N I	S G	A A	N G	T A	V L	Z N	C N
S0	1.00	16:13				X			X	X				X				X						X	
S25	1.00	16:17				X			X	X	X	X	X	X				X						X	
ICV	1.00	16:19				X			X	X	X	X	X	X				X						X	
CCV	1.00	16:22				X			X	X	X	X	X	X				X						X	
CCB	1.00	16:26				X			X	X	X	X	X	X				X						X	
CRDL1	1.00	16:30				X			X	X	X	X	X	X				X						X	
ICSA	1.00	16:33				X			X	X	X	X	X	X				X						X	
ICSAB	1.00	16:36				X			X	X	X	X	X	X				X						X	
PBS	5.00	16:44				X			X	X	X	X	X	X				X						X	
LCSS	20.00	16:46				X			X	X	X	X	X	X				X						X	
K9908537-006S	5.00	16:50				X			X	X	X	X	X	X				X						X	
K9908537-006A	5.00	16:52				X			X	X	X	X	X	X				X						X	
K9908537-006L	25.00	17:03				X			X	X	X	X	X	X				X						X	
K9908537-006	5.00	17:06				X			X	X	X	X	X	X				X						X	
K9908537-006D	5.00	17:09				X			X	X	X	X	X	X				X						X	
CCV	1.00	17:13				X			X	X	X	X	X	X				X						X	
CCB	1.00	17:17				X			X	X	X	X	X	X				X						X	
K9908537-001	5.00	17:21				X			X	X	X	X	X	X				X						X	
ZK9908537-010	5.00	17:24																							
ZK9908537-010	10.00	17:29																							
K9908537-010	25.00	17:35				X			X	X	X	X	X	X				X						X	
ZZZZZZ	5.00	17:40																							
ZZZZZZ	5.00	17:43																							
ZZZZZZ	10.00	17:49																							
ZZZZZZ	10.00	17:51																							
ZZZZZZ	1.00	17:56																							
ZZZZZZ	1.00	17:58																							
CCV	1.00	18:03				X			X	X	X	X	X	X				X						X	
ZZZZZZ	1.00	18:06				X			X	X	X	X	X	X				X						X	
CCB	1.00	18:11				X			X	X	X	X	X	X				X						X	

\* - Denotes additional elements (other than the standard elements) are represented on another Form 14

## lumbia Analytical Services, Inc

**TOTAL METALS**  
**- 14 -**  
**ANALYSIS RUN LOG**

ntract Hart Crowser, Inc.

b Code: KLAB Case No.: 5792-06 SAS No.:  SDG No.: K9908537  
Instrument ID Number: VG ICPMS Method: MS  
Start Date: 12/3/99 End Date: 12/3/99

Sample No.	D/F	Time	% R	Analytes																					
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N I	K E	S G	A A	V L	Z N	C N
0	1.00	20:08		X																				X	
25	1.00	20:09		X																				X	
CV	1.00	20:10		X																				X	
CV	1.00	20:13		X																				X	
ZZZZZ	1.00	20:18																							
ZZZZZ	1.00	20:21																							
CB	1.00	20:23		X																				X	
RA	1.00	20:25		X																				X	
CSA	1.00	20:26		X																				X	
CSAB	1.00	20:27		X																				X	
PBS	5.00	20:34		X																				X	
CSS	20.00	20:36		X																				X	
K9908537-006S	5.00	20:37		X																				X	
ZZZZZ	1.00	20:38																							
K9908537-006A	5.00	20:40		X																				X	
ZZZZZ	1.00	20:56																							
K9908537-006L	25.00	20:59		X																				X	
ZZZZZ	1.00	21:01																							
ZZZZZ	1.00	21:10																							
K9908537-006	5.00	21:11		X																				X	
K9908537-006D	5.00	21:13		X																				X	
K9908537-001	5.00	21:15		X																				X	
K9908537-010	5.00	21:16		X																				X	
ZZZZZ	5.00	21:18																							
ZZZZZ	5.00	21:19																							
ZZZZZ	5.00	21:20																							
CCV	1.00	21:21		X																				X	
CCB	1.00	21:36		X																				X	
ZZZZZ	1.00	21:37																							
ZZZZZ	1.00	21:38																							
ZZZZZ	1.00	21:40																							
ZZZZZ	1.00	21:41																							
ZZZZZ	1.00	21:42																							
ZZZZZ	1.00	21:43																							

- Denotes additional elements (other than the standard elements) are represented on another Form 14

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SW-846

**Columbia Analytical Services, Inc****TOTAL METALS****-14-****ANALYSIS RUN LOG**Contract Hart Crowser, Inc.Lab Code: KLABCase No.: 5792-06

SAS No.:

SDG No.: K9908537Instrument ID Number: VG ICPMSMethod: MSStart Date: 12/3/99End Date: 12/3/99

Sample No.	D/F	Time	% R	Analytes																							
				A L	S B	A S	B A	B E	C D	C A	C R	C O	C U	F E	P B	M G	M N	H G	N G	I I	K E	S E	A G	N A	T G	Z L	C N
ZZZZZZ	1.00	21:51																									
ZZZZZZ	1.00	21:52																									
CCV	1.00	21:53				X																			X		
CCB	1.00	22:03				X																			X		

\* - Denotes additional elements (other than the standard elements) are represented on another Form 14

## **COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K9908557  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99  
**Date Extracted:** 12/2/99  
**Date Analyzed:** 12/7/99

## Surrogate Recovery Summary Butyltins in Porewater

**Prep Method:** EPA 3520C      **Analysis Method:** Krone      **Units:** PERCENT  
**Basis:** NA

Sample Name	Lab Code	Test Notes	Percent Recovery Tri-n-propyltin Cation	Percent Recovery Tri-n-pentyltin Cation
HC-BS01-C1	K9908537-001		75	69
HC-BS01-BARGE-C1	K9908537-006		70	75
HC-BS03-C1	K9908537-010		81	88
Lab Control Sample	KWG9904302-1		83	81
Lab Control Sample	KWG9904302-2		79	85
Method Blank	KWG9904302-3		71	81

CAS Acceptance Limits: 21-107 21-116

Approved By:

SUR2/111397P

08537SVG.AY1 - SURC 12/13/99

Date: 12-13-99

00065

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
LCS Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA  
Date Extracted: 12/2/99  
Date Analyzed: 12/7/99

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary  
Butyltins in Porewater

Sample Name: Lab Control Sample Units: ug/L (ppb)  
Lab Code: KWG9904302-1, KWG9904302-2 Basis: NA  
Test Notes:

Analyte	Prep Method	Analysis Method	True Value		Result		Acceptance Limits	Percent Difference	Relative CAS	Result Notes
			LCS	DLCS	LCS	DLCS				
Tetra-n-butyltin	EPA 3520C	Krone	0.50	0.50	0.49	0.44	98	88	23-131	11
Tri-n-butyltin Cation	EPA 3520C	Krone	0.50	0.50	0.52	0.51	104	102	23-131	2
Di-n-butyltin Cation	EPA 3520C	Krone	0.50	0.50	0.47	0.46	94	92	16-118	2
n-Butyltin Cation	EPA 3520C	Krone	0.50	0.50	0.47	0.52	94	104	17-128	10

Approved By: Jay

DLCS/080797p

Date: 12-13-99

08537SVG.AY1 - DLCS 12/13/99

00066

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930

Service Request: K9908537  
Calibration Date: 12/6/99  
Date Analyzed: 12/7/99

Continuing Calibration Verification (CCV) Summary

Butyltins

Methodology Based on Krone

Units:  $\mu\text{g/L}$  (ppb)

Analyte	True Value	CCV1 Result	Percent Recovery
Tetra-n-butyltin	500	491	98
Tri-n-butyltin Cation	500	478	96
Di-n-butyltin Cation	500	498	100
n-Butyltin Cation	500	493	99

Approved By: Jes Date: 12/13/99

CCV 1-4/042795

0853:SVG.AY1 - CCV 1 12/13/99

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Page No.:  
1

COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K9908537  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99  
**Date Extracted:** 12/3/99  
**Date Analyzed:** 12/10/99

## Surrogate Recovery Summary Organochlorine Pesticides

Prep Method: EPA 3540C      Units: PERCENT  
Analysis Method: 8081A      Basis: NA

Sample Name	Lab Code	Test Notes	Tetrachloro-m-xylene	Percent Recovery	Decachlorobiphenyl
HC-BS01-C1	K9908537-001		92		94
HC-BS01-BARGE-C1	K9908537-006		91		97
HC-BS03-C1	K9908537-010		84		84
Lab Control Sample	KWG9904313-1		99		89
Lab Control Sample	KWG9904313-2		89		88
Method Blank	KWG9904313-3		92		90

CAS Acceptance Limits: 20-107 20-142

Approved By: yes Date: 12-13-99

SUR2/111397D

Date: 12-13.99

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 LCS Matrix: Sediment

Service Request: K9908537  
 Date Collected: NA  
 Date Received: NA  
 Date Extracted: 12/3/99  
 Date Analyzed: 12/10/99

Laboratory Control Sample/Duplicate Laboratory Control Sample Summary  
 Organochlorine Pesticides

Sample Name: Lab Control Sample Units: ug/Kg (ppb)  
 Lab Code: KWG9904313-1, KWG9904313-2 Basis: Dry  
 Test Notes:

Analyte	Prep Method	Analysis Method	True Value		Result		Percent Recovery		Acceptance Limits	Relative Percent Difference	Result Notes
			LCS	DLCS	LCS	DLCS	LCS	DLCS			
gamma-BHC (Lindane)	EPA 3540C	8081A	20	20	25	21	125	105	21-123	17	
Heptachlor	EPA 3540C	8081A	20	20	20	22	100	110	31-112	10	
Aldrin	EPA 3540C	8081A	20	20	21	23	105	115	26-127	9	
Dieldrin	EPA 3540C	8081A	20	20	22	25	110	125	18-161	13	
4,4'-DDT	EPA 3540C	8081A	20	20	22	25	110	125	30-146	13	

Approved By: 

DLCS/080797p

08537SVG.AY3 - DLCS 12/13/99

Date: 12-13-99

00069

Signal #1 : J:\GC14\DATA\120999\1209F034.D  
 Signal #2 : J:\GC14\DATA\120999\1209F034.D\1209R034.D  
 Acq On : 10 Dec 99 8:15  
 Sample : 8081 + 2,4-DD's @ 50ug/L | GCPS3-1-B  
 Method : 1209PEST.M

### Continuing Calibration Verification (CCV) Summary

Analytes	Solution ug/L		%Rec#1	%Rec#2
	Conc#1	Conc#2		
2) alpha-BHC	45.96	45.60	91.9%	91.2%
3) beta-BHC	49.58	48.88	99.2%	97.8%
4) gamma-BHC(Lindane)	46.19	57.41	92.4%	114.8%
5) delta-BHC	45.88	45.14	91.8%	90.3%
6) Heptachlor	45.94	47.61	91.9%	95.2%
7) Aldrin	48.86	47.86	97.7%	95.7%
8) Heptachlor Epoxide	46.16	48.12	92.3%	96.2%
9) gamma-Chlordane	46.18	47.63	92.4%	95.3%
10) 2,4'-DDE	47.57	46.94	95.1%	93.9%
11) Endosulfan I	47.92	47.03	95.8%	94.1%
12) alpha-Chlordan	46.71	48.07	93.4%	96.1%
13) Dieldrin	47.71	47.16	95.4%	94.3%
14) 4,4'-DDE	47.15	47.35	94.3%	94.7%
15) 2,4'-DDD	47.77	48.93	95.5%	97.9%
16) Endrin	46.74	47.40	93.5%	94.8%
17) Endosulfan II	46.39	46.47	92.8%	92.9%
18) 4,4'-DDD	47.39	46.96	94.8%	93.9%
19) 2,4'-DDT	47.51	49.52	95.0%	99.0%
20) Endrin Aldehyde	46.30	47.10	92.6%	94.2%
21) Endosulfan Sulfate	48.28	46.87	96.6%	93.7%
22) 4,4'-DDT	48.28	47.78	96.6%	95.6%
23) Endrin Ketone	48.82	48.27	97.6%	96.5%
24) Methoxychlor	44.93	46.53	89.9%	93.1%

Average %oD: 5.8% 5.6%

Signal #1 : J:\GC14\DATA\120999\1209F048.D  
 Signal #2 : J:\GC14\DATA\120999\1209F048.D\1209R048.D  
 Acq On : 10 Dec 99 16:17  
 Sample : 8081 + 2,4-DD's @ 50ug/L | GCPS3-1-B  
 Method : 1209PEST.M

### Continuing Calibration Verification (CCV) Summary

Analytes	Solution ug/L		%Rec#1	%Rec#2
	Conc#1	Conc#2		
2) alpha-BHC	46.18	59.98	92.4%	120.0% H
3) beta-BHC	49.02	48.22	98.0%	96.4%
4) gamma-BHC(Lindane)	46.19	56.26	92.4%	112.5%
5) delta-BHC	45.69	44.77	91.4%	89.5%
6) Heptachlor	45.90	47.20	91.8%	94.4%
7) Aldrin	48.88	46.78	97.8%	93.6%
8) Heptachlor Epoxide	45.93	48.24	91.9%	96.5%
9) gamma-Chlordane	45.91	46.26	91.8%	92.5%
0) 2,4'-DDE	47.72	46.08	95.4%	92.2%
1) Endosulfan I	48.60	46.27	97.2%	92.5%
2) alpha-Chlordane	45.96	47.57	91.9%	95.1%
3) Dieldrin	47.64	47.37	95.3%	94.7%
4) 4,4'-DDDE	46.98	46.87	94.0%	93.7%
5) 2,4'-DDD	47.40	48.68	94.8%	97.4%
6) Endrin	46.70	47.39	93.4%	94.8%
7) Endosulfan II	46.03	46.71	92.1%	93.4%
8) 4,4'-DDD	47.31	46.58	94.6%	93.2%
9) 2,4'-DDT	47.02	48.67	94.0%	97.3%
0) Endrin Aldehyde	45.47	41.17	90.9%	82.3% L
1) Endosulfan Sulfate	48.52	49.96	97.0%	99.9%
2) 4,4'-DDT	48.52	47.30	97.0%	94.6%
3) Endrin Ketone	48.39	47.64	96.8%	95.3%
4) Methoxychlor	44.18	44.75	88.4%	89.5%

Average %D: 6.2% 7.2%

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COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Extracted: 12/3/99  
Date Analyzed: 12/11/99

Surrogate Recovery Summary  
Polychlorinated Biphenyls (PCBs)

Prep Method: EPA 3540C  
Analysis Method: 8082

Units: PERCENT  
Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery
HC-BS01-C1	K9908537-001		112
HC-BS01-BARGE-C1	K9908537-006		118
HC-BS03-C1	K9908537-010		113
Lab Control Sample	KWG9904313-3		112
Lab Control Sample	KWG9904313-2		113
Method Blank	KWG9904313-4		102

CAS Acceptance Limits: 20-142

Approved By:

Date: 12-13-99

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
LCS Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA  
Date Extracted: 12/3/99  
Date Analyzed: 12/11/99

**Laboratory Control Sample/Duplicate Laboratory Control Sample Summary  
Polychlorinated Biphenyls (PCBs)**

Sample Name: Lab Control Sample Units: ug/Kg (ppb)  
Lab Code: KWG9904313-3, KWG9904313-2 Basis: Dry  
Test Notes:

Analyte	Prep Method	Analysis Method	True Value		Result		Acceptance Limits	Relative Percent Difference	Result Notes
			LCS	DLCS	LCS	DLCS			
Aroclor 1016	EPA 3540C	8082	200	200	202	218	101	109	30-150 8
Aroclor 1260	EPA 3540C	8082	200	200	188	208	94	104	30-150 10

Approved By: \_\_\_\_\_

Date: 12-13-99

DLCS/080797p

085375VG.AY2 - DLCS 12/13/99

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Page No.: \_\_\_\_\_

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K9908537  
Date Analyzed: 12/11/99

Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)

Sample Name: CCV1  
Lab Code: 1211f005  
Test Notes:

Units: ug/L (ppb)  
Basis: NA

Analyte	Analysis Method	True Value	Result	CAS		Result Notes
				Acceptance Limits	Percent Recovery	
Aroclor 1016	8082	1000	929	850-1150	93	
Aroclor 1260	8082	1000	872	850-1150	87	

Approved By: Jay

ccv/021397p

Date: 12-13-99

08537SVG.AY2 - CCV1 12/13/99

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**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K9908537  
**Date Analyzed:** 12/11/99

**Continuing Calibration Verification (CCV) Summary  
Polychlorinated Biphenyls (PCBs)**

**Sample Name:** CCV2  
**Lab Code:** 1211f025  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

<b>Analyte</b>	<b>Analysis Method</b>	<b>True Value</b>	<b>Result</b>	<b>CAS</b>		<b>Result Notes</b>
				<b>Acceptance Limits</b>	<b>Percent Recovery</b>	
Aroclor 1016	8082	1000	1030	850-1150	103	
Aroclor 1260	8082	1000	945	850-1150	94	

**Approved By:** Jes **Date:** 12-13-99

CCV/021397p

08537SVG.AY2 - CCV2 12/13/99

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## Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99

**Total Solids**

Test Method: NONE Units: PERCENT  
Analysis Method: 160.3M Basis: Wet  
Test Notes:

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
IC-VC-BS01-01	K2000914-001	2/9/00	79.0	
IC-VC-BS01-02	K2000914-002	2/9/00	77.5	

Approved By: CR Date: 3/15/00

SOLIDX.XLT\_Sample/01071998a

00914TS.AB1 - 002 2/10/00

00043

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 2/15/00

Butyltins in Porewater

Sample Name: HC-VC-BS01-01 Units: ug/L (ppb)  
Lab Code: K2000914-001 Basis: NA  
Test Notes: X,G

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	
tri-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.50	
Di-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.07	
-Butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered  
The MRL is elevated because an insufficient sample quantity was available for optimum analysis.

Approved By: VN Date: 2-22-00  
22/020597p

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

lient: Hart Crowser, Inc.  
roject: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99  
**Date Porewater Extracted:** 2/15/00

## Butyltins in Porewater

mple Name: HC-VC-BS01-02 Units: ug/L (ppb)  
ab Code: K2000914-002 Basis: NA  
est Notes: X,G

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
stra-n-butyltin	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	
i-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.70	
i-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.07	
Butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered  
The MRL is elevated because an insufficient sample quantity was available for optimum analysis.

Approved By: VN Date: 2-22-00

522020597p

00914SVG.AY1 - 2 2/22/00

Page No.:  
**00005**

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914

Date Collected: NA

Date Received: NA

Date Porewater Extracted: 2/15/00

Butyltins in Porewater

Sample Name: Method Blank Units: ug/L (ppb)  
Lab Code: KWG2000574-4 Basis: NA  
Test Notes: X

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Tetra-n-butyltin	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
Di-n-butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
n-Butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

Approved By:

VN

S22/020597p

Date: 2-22-00

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

ient: Hart Crowser, Inc.  
ject: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99

## Duplicate Summary

## Total Solids

ep Method: NONE  
alysis Method: 160.3M  
st Notes:

Units: PERCENT  
Basis: Wet

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
-VC-BS01-01	K2000914-001DUP	2/9/00	79.0	77.8	78.4	2	

Approved By: CC Date: 2/15/00

LIDS.XLT\_DUP/09291998a

00914TS.AB1 - DUP 2/10/00

000017

**COLUMBIA ANALYTICAL SERVICES, INC.****QA/QC Report**

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99  
**Date Extracted:** 2/15/00  
**Date Analyzed:** 2/17 - 18/00

**Surrogate Recovery Summary**  
**Butyltins in Porewater**

**Prep Method:** EPA 3520C                   **Units:** PERCENT  
**Analysis Method:** Krone                   **Basis:** NA

<b>Sample Name</b>	<b>Lab Code</b>	<b>Test Notes</b>	<b>Percent Recovery</b>	
			<b>Tri-n-propyltin Cation</b>	<b>Tri-n-pentyltin Cation</b>
HC-VC-BS01-01	K2000914-001		88	86
HC-VC-BS01-02	K2000914-002		84	84
Batch QC	K2001000-003		86	85
Batch QC	K2001000-003MS		80	76
Batch QC	K2001000-003DMS		84	82
Lab Control Sample	KWG2000574-3		91	86
Method Blank	KWG2000574-4		81	90

**CAS Acceptance Limits:**                   **21-107**                   **21-116**

**Approved By:** VW                   **Date:** 2-22-00

SUR2/111397p

00914SVG.AY1 - SUR2 2/22/00

Page No.:

00018

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

to: Hart Crowser, Inc.  
 Re: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K2000914  
 Date Collected: NA  
 Date Received: NA  
 Date Extracted: 2/15/00  
 Date Analyzed: 2/17/00

Matrix Spike/Duplicate Matrix Spike Summary  
 Butyltins in Porewater

Sample Name: Batch QC Units: ug/L (ppb)  
 Sample Code: K2001000-003MS, Basis: NA  
 Notes:

Item	Prep Method	Analysis Method	Spike Level				Spike Result		Percent Recovery		Relative Acceptance	Result
			MRL	MS	DMS	Sample Result	MS	DMS	MS	DMS		
-n-butyltin	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.7	0.7	70	70	20-116	<1
-butyltin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.9	0.9	90	90	20-116	<1
butyltin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.7	0.7	70	70	20-116	<1
ytin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	1.0	0.9	100	90	20-116	11

Reviewed By: VW Date: 2-22-00

20597p

00914SVGAY1 - DMS 2/22/00

Page No.:

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**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**LCS Matrix:** Sediment

**Service Request:** K2000914  
**Date Collected:** NA  
**Date Received:** NA  
**Date Extracted:** 2/15/00  
**Date Analyzed:** 2/17/00

**Laboratory Control Sample Summary**  
**Butyltins in Porewater**

**Sample Name:** Lab Control Sample  
**Lab Code:** KWG2000574-3  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

<b>Analyte</b>	<b>Prep Method</b>	<b>Analysis Method</b>	<b>True</b>	<b>Result</b>	<b>Percent Recovery</b>	<b>CAS Percent Recovery</b>	<b>Acceptance Limits</b>	<b>Result Notes</b>
			<b>Value</b>					
Tetra-n-butyltin	EPA 3520C	Krone	0.50	0.40	80	23-131		
Tri-n-butyltin Cation	EPA 3520C	Krone	0.50	0.47	94	23-131		
Di-n-butyltin Cation	EPA 3520C	Krone	0.50	0.41	82	16-118		
n-Butyltin Cation	EPA 3520C	Krone	0.50	0.48	96	17-128		

Approved By: WJ

Date: 2-22-00

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Analyzed:** 2/17/00

**Continuing Calibration Verification (CCV) Summary**  
**Butyltins in Porewater**

**Sample Name:** CCV1  
**Lab Code:** 0217F010  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

<b>Analyte</b>	<b>Analysis Method</b>	<b>True Value</b>	<b>Result</b>	<b>CAS</b>		<b>Result Notes</b>
				<b>Acceptance Limits</b>	<b>Percent Recovery</b>	
Tetra-n-butyltin	Krone	490	527	368-613	108	
Tri-n-butyltin Cation	Krone	475	509	356-594	107	
Di-n-butyltin Cation	Krone	510	533	383-638	105	
n-Butyltin Cation	Krone	492	513	369-615	104	

**Approved By:** VN **Date:** 2-22-00

CCV/021397p

00914SVG.AY1 - CCV1 2/22/00

Page No.:  
00011

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Analyzed: 2/18/00

Continuing Calibration Verification (CCV) Summary  
Butyltins in Porewater

Sample Name: CCV2  
Lab Code: 0217F023

Units: ug/L (ppb)  
Basis: NA

Test Notes:

Analyte	Analysis Method	True Value	Result	CAS		Result Notes
				Acceptance Limits	Percent Recovery	
Tetra-n-butyltin	Krone	490	510	368-613	104	
Tri-n-butyltin Cation	Krone	475	502	356-594	106	
Di-n-butyltin Cation	Krone	510	518	383-638	102	
n-Butyltin Cation	Krone	492	501	369-615	102	

Approved By: VN

CCV/021397p

Date: 2-22-00

00914SVG.AY1 - CCV2 2/22/00

00012

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Analyzed:** 2/18/00

**Continuing Calibration Verification (CCV) Summary**  
**Butyltins in Porewater**

**Sample Name:** CCV3  
**Lab Code:** 0217F036  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

<b>Analyte</b>	<b>Analysis Method</b>	<b>True Value</b>	<b>Result</b>	<b>CAS Acceptance Limits</b>		<b>Percent Recovery</b>	<b>Result Notes</b>
				368-613	356-594		
Tetra-n-butyltin	Krone	490	512	368-613	356-594	104	
Tri-n-butyltin Cation	Krone	475	485	368-613	356-594	102	
Di-n-butyltin Cation	Krone	510	513	383-638	369-615	101	
n-Butyltin Cation	Krone	492	510	369-615	356-594	104	

Approved By: VW Date: 2-22-00

CCV/021397p

00914SVG.AY1 - CCV3 2/22/00

Page No.:  
00013

## EPA Method 160.3 - Total Solids

WORKGROUP: KWG2000494

Analyst: ABaird

Reviewed By: LL

Date Acquired: 9 Feb 00 04:10 PM

Date Reviewed: 2/15/00

Date Completed: 10 Feb 00 10:17 AM

OvenTemp: 105

#	Lab Code	Tare	Wet Wt	Tare+Dry	Dry Wt	% Solids	Description	Matrix	Sample Name	QC Ref Sample
1	K2000914-001	1.0100	10.5000	9.3000	8.2900	79.0		TS-MET	TS	
2	K2000914-002	1.0200	10.6100	9.2400	8.2200	77.5		TS-MET	TS	
3	K2000921-001	1.0100	11.8900	11.3200	10.3100	86.7		TS-MET	TS	
4	K2000921-002	1.0200	11.4400	11.2200	10.2000	89.2		TS-MET	TS	
5	K2000921-006	1.0200	10.6700	9.2800	8.2600	77.4		TS-MET	TS	
6	K2000921-008	1.0300	10.4800	9.0000	7.9700	76.0		TS-MET	TS	
7	K2000921-012	1.0200	10.4400	10.2600	9.2400	88.5		TS-MET	TS	
8	KWG2000494-1	1.0300	11.3500	9.8600	8.8300	77.8		TS-MET	TS	K2000914-001
9	KWG2000494-2	1.0200	10.7000	10.2600	9.2400	86.4		TS-MET	TS	K2000921-001

00014

## COLUMBIA ANALYTICAL SERVICES, INC.

K2000914

Request No.: K2000723R / K2001000  
st: Karina Gress

Date Extracted: 2/15/00

Extraction lot: KWG: 2000574

## Organotins in Water

ID	Client ID	Sample Volume	pH	Surf	MS	Der	HCl	C-U	Final Volume
3-232	IR17WB070A	315	≤2	50μL	—	2mL	2mL	3mL/320	0.5mL
-1	HC-L02-C07	260			—				
-2	HC-L03-PB	250			—				
3	HC-L03-E00	250			—				
3mS	↓	250		50μL					
3Dms	↓	250		↓					
-1	HC-VC-B501-01	88			—				
-2	HC-VC-B501-02	85			—				
WL	Lab Control	500			50μL				
WB	Method blank	500			—				
PB	Porewater Blank	500			—				
-4	HC-L03-C01	230	↓	↓	—	↓	↓	↓	↓
<del>Karen Gress</del> 02/500						LK 2-16-00 → LK 2-17-00 →			

lients:

ard batch: 82 Hexane lot # 3923p Pentane lot # BP704 DCM lot # 39243

Start Time/Date/Initial: 4:535pm/2/15/00/KG Stop Time/Date/Initial: 11:35Am/2/16/00/KG

gate ID: 0T2-72-C/5ppm/50μL/EppC/Exp 03/19/00

ID: 0T2-73-G/5ppm/50μL/EppC/Exp 03/21/00

Blue Extract Storage: NA Extract Received: LK 2-17-00

ssed By: J. Kennedy Date: 2-15-00

ewed By: LK Date: 2-18-00

## COLUMBIA ANALYTICAL SERVICES, INC.

## Water / Liquid

WORKGROUP: KWG2000574

Prep Method: 3520B

Analyst: kgress

Date Extracted: 15 Feb 00 08:59 AM

Reagent Added(ul):

Spike Added(ul):

Comments:

Lab Code	Client ID	Sample Vol	SS	pH B/N	pH Acid	Final Vol	Surr ID	Surr EXP	Spike ID
2000723-023	JIR17WB070A	315.000				0.500			
2000914-001	JHC-VC-BS01-01	88.000				0.500			
2000914-002	JHC-VC-BS01-02	85.000				0.500			
2001000-001	JHC-L02-C07	260.000				0.500			
2001000-002	JHC-L03-PB	250.000				0.500			
2001000-003	JHC-L03-LW	250.000				0.500			
2001000-004	JHC-L03-C01	230.000				0.500			
VG2000574-1	Method Blank	500.000				0.500			
VG2000574-2	Matrix Spike	250.000				0.500			
VG2000574-2	Matrix Spike	250.000				0.500			
VG2000574-3	Duplicate Matrix Spi	250.000				0.500			
VG2000574-4	Lab Control Sample	500.000				0.500			
VG2000574-5	Method Blank	500.000				0.500			
						0.500			

00016

**COLUMBIA ANALYTICAL SERVICES, INC.**

vice Request No.: 2000914

Date Extracted: 7/15/00

Iust: Karibac: Gross

HOLD TIME FOR ORGANOTIN EXTRACTION: 2/22/00

## **Interstitial / Pore Water Extraction**

rents: \_\_\_\_\_

ID: NA

Is it Filtered? (Circle one) : YES /  NO EXTRACT STORAGE: Samson 93

essed By: NA

Date:

swed By: J ✓

Date: 2-18-00

Signal #1 : J:\GC11\DATA\021700\0217F024.D  
 Acq On : 18 Feb 00 01:28 AM  
 Sample : K2000914-001 | HC-VC-BS01-01  
 Misc : SVG\PORE-TIN00914001.H | F=.5 D=1 A=88

Vial: 14  
 Operator: lkennedy  
 Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
 Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
 Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 88

$$\text{Conversion Factor} = (F \times D) / = 0.005682$$

Volume Inj. : 3  $\mu$ L

Signal #1 : RTX-50

Signal #2 : RTX-200

*Raised mL to 0.06 ng/L G*

#### Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2	
Tin-n-propyltin	9.38	7.71	336349	49280	441.3	331.8	88.26	66.37	%
Tri-n-pentyltin	16.53	13.99	274162	43568	429.8	355.1	85.97	71.03	%

#### Solution                          Original

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Conc#1	Conc#2	Units
Tetra-n-butyltin	9.90	0.00	1912	0	2.7	0.0	0.016	0.000	ppb
Tri-n-butyltin	12.81	10.57	77227	12881	88.3	76.8	0.502	0.436	ppb
Di-n-butyltin	15.61	12.94	13054	858	12.2	9.0	ND	0.070	ppb
n-Butyltin	17.36	15.26	14424	1412	9.8	4.6	0.056	0.026	ppb

#### Analytes as Sn

#### Sn Conversion Factors

Tetra-n-butyltin	0.3419	0.005	0.000	ng/ml
Tri-n-butyltin	0.4092	0.205	0.178	ng/ml
Di-n-butyltin	0.5095	0.035	0.012	ng/ml
n-Butyltin	0.6751	0.038	0.018	ng/ml

*UK  
2/18/00*

DRIG CONC (< 0) are considered ND - None Detected

J217F024.D TINS.MTH

*VN  
2.22.00*

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50	Signal #2 Phase: RTX-200
Signal #1 Info : 0.53mm id	Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
----------	------	------	--------	--------	-------	-------

**System Monitoring Compounds**

S Tri-n-propyltin	9.38	7.71	336349	49280	441.302	331.826
			Recovery	=	88.26%	66.37%
S Tri-n-pentyltin	16.53	13.99	274162	43568	429.825	355.150
			Recovery	=	85.97%	71.03%

**Target Compounds**

Tetra-n-butyltin	9.90f	0.00	1912	0	2.736	N.D. #
Tri-n-butyltin	12.81	10.57	77227	12881	88.322	76.762
Di-n-butyltin	15.61	12.94	13054	858	12.242	3.988 #
n-Butyltin	17.36	15.26	14424	1412	9.844	4.584 #

U  
2/18/00

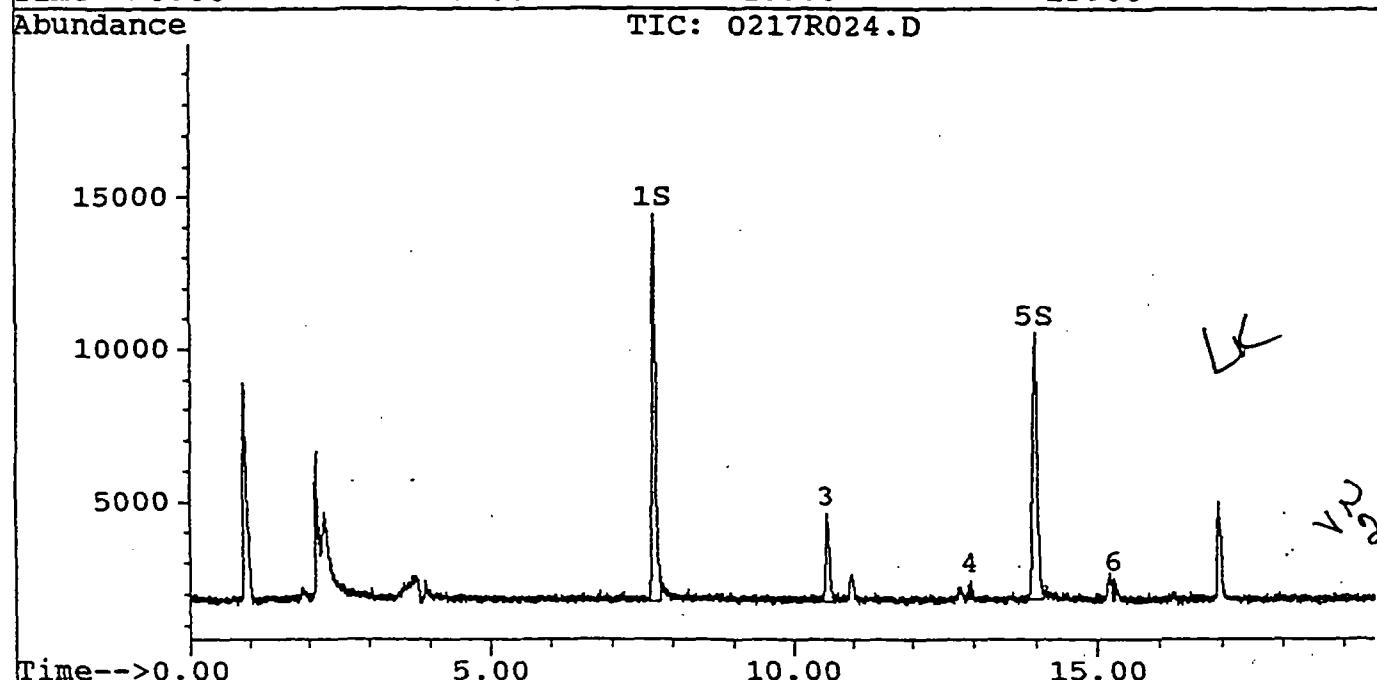
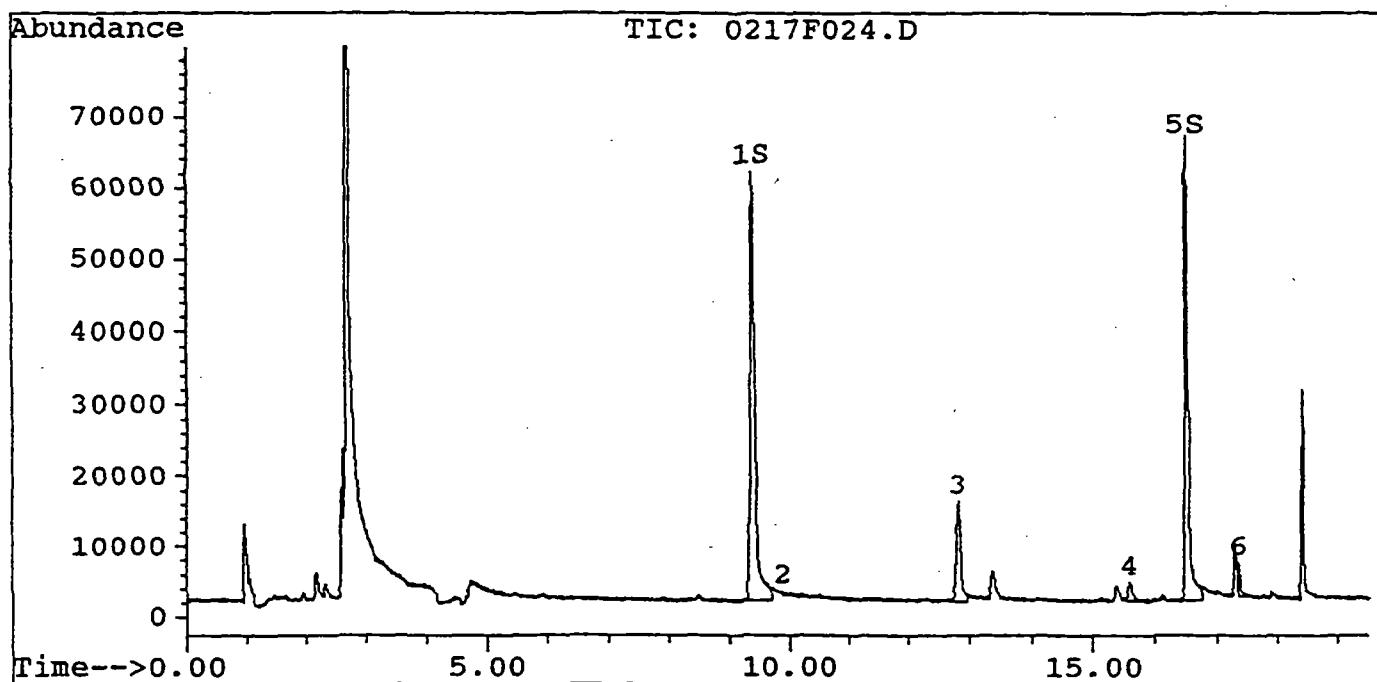
1/22/00

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

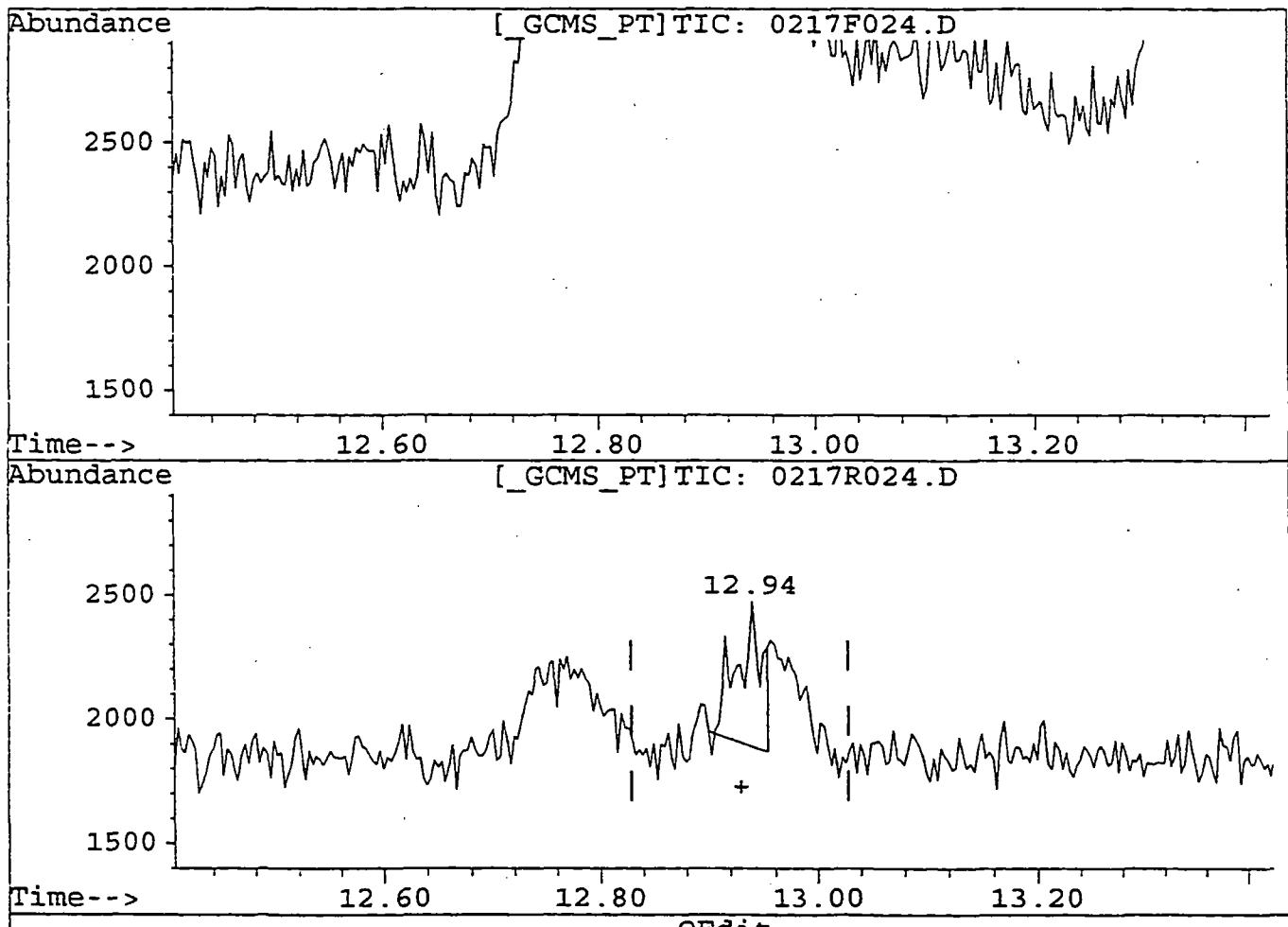
Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Tue Feb 22 08:37:56 2000  
 Response via : Multiple Level Calibration



(4) Di-n-butyltin  
15.61min 12.24ng/ml  
response 13054

(4) Di-n-butyltin #2  
12.94min 3.99ng/ml  
response 858

*before  
12.22.0*

(+) = Expected Retention Time

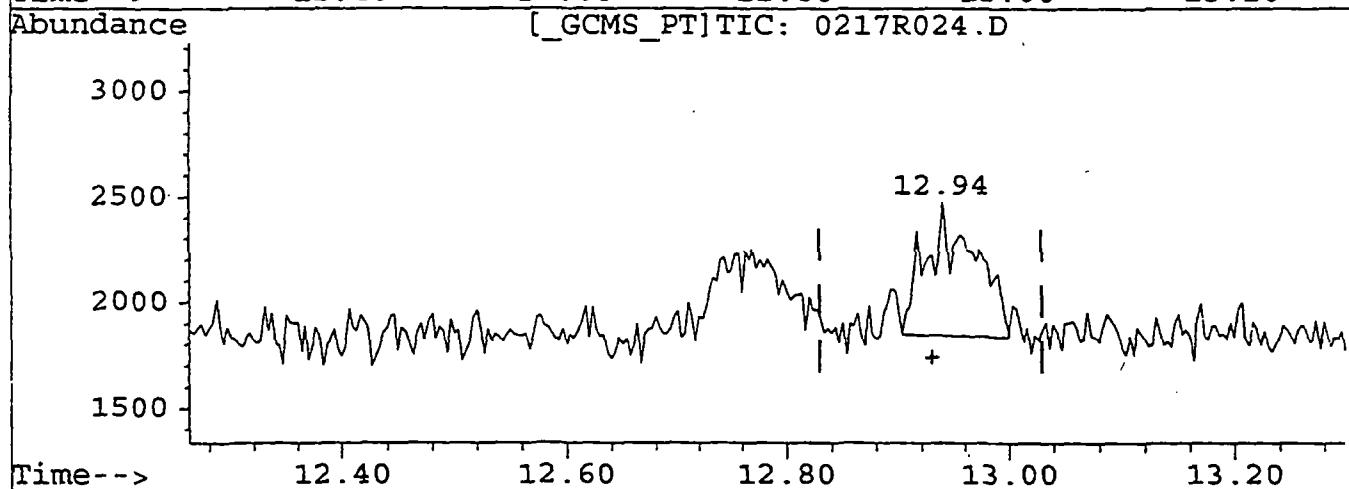
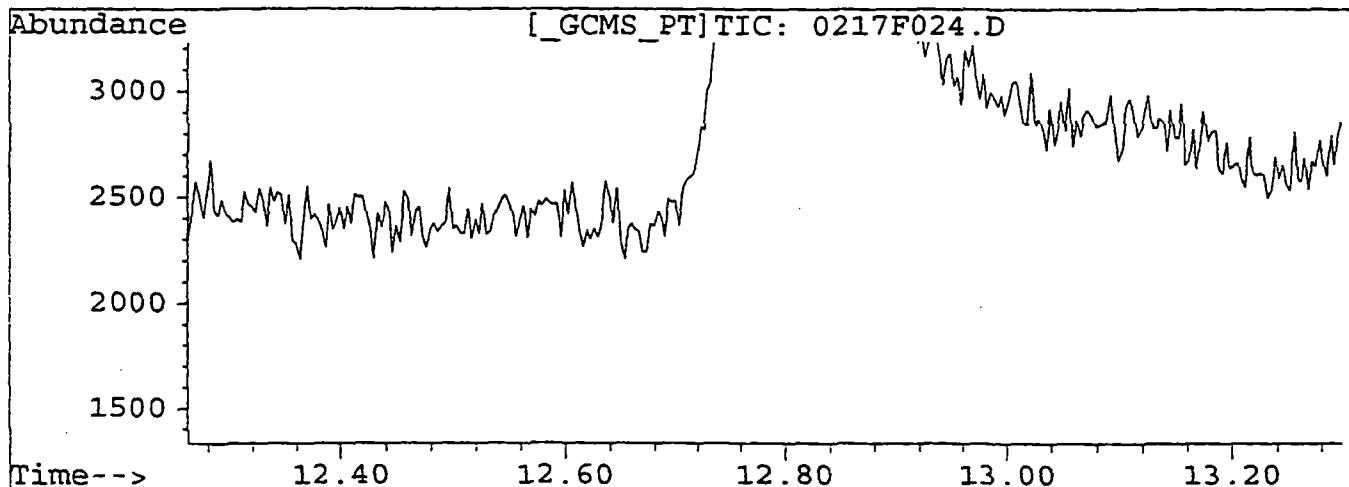
0217F024.D 0209TINS.M Tue Feb 22 09:24:16 2000

00021

Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Tue Feb 22 08:37:56 2000  
 Response via : Multiple Level Calibration



QEdit

(4) Di-n-butyltin  
15.61min 12.24ng/ml  
response 13054

(4) Di-n-butyltin #2  
12.94min 8.97ng/ml m  
response 1930

*after better confirmatory  
1/2 2/23/00*

(+) = Expected Retention Time

0217F024.D 0209TINS.M Tue Feb 22 09:25:27 2000

00022

Signal #1 : J:\GC11\DATA\021700\0217F025.D

Acq On : 18 Feb 00 01:52 AM

Sample : K2000914-002 | HC-VC-BS01-02

Misc : SVG\PORE-TIN\00914002.H | F=.5 D=1 A=85 ✓

Vial: 15

Operator: lkennedy

Inst : GC11

Method : TINS.MTH

F=Final Volume (mls) = 0.5

Title : Butyltins by GC-FPD

D=Dilution Factor = 1

Last Update : Fri Feb 18 09:43:00 2000

A=Amount Extracted (g or m) = 85

Conversion Factor =  $(F \times D) / A$  = 0.005882

Volume Inj. : 3 μL

Signal #1 : RTX-50

Signal #2 : RTX-200

Raised  
to  
0.06 mg/L G

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2
i-n-propyltin	9.37	7.71	318887	46636	418.4	314.0	83.68	62.80 %
i-n-pentyltin	16.53	13.98	266801	42516	418.3	346.6	83.66	69.31 %

Solution

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Original	Units
Tetra-n-butyltin	9.92	0.00	893	0	1.3	0.0	0.008	0.000 ppb
Tri-n-butyltin	12.81	10.56	103878	16891	118.8	100.7	0.699	0.592 ppb
Di-n-butyltin	15.61	12.94	12704	1613	11.9	7.5	0.070	0.044 ppb
-Butyltin	17.36	15.19	9012	1384	6.2	4.5	0.036	0.026 ppb

Analytes as Sn

Sn Conversion Factors

Tetra-n-butyltin	0.3419	0.003	0.000	ng/ml
Tri-n-butyltin	0.4092	0.286	0.242	ng/ml
Di-n-butyltin	0.5095	0.036	0.022	ng/ml
-Butyltin	0.6751	0.024	0.018	ng/ml

LF  
2-18-00  
2-22-00  
v2

TRIG CONC (< 0) are considered ND - None Detected

217F025.D TINS.MTH

butyltin

Page 1

00023  
2/18/00 11:14 AM

Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F025.D Vial: 15  
 Signal #2 : J:\GC11\DATA\021700\0217F025.D\0217R025.D  
 Acq On : 18 Feb 00 01:52 AM Operator: lkennedy  
 Sample : K2000914-002 | HC-VC-BS01-02 Inst : GC11  
 Misc : SVG\PORE-TIN\00914002.H | F=.5 D=1 A=85 Multiplr: 1.00  
 Quant Time: Feb 18 9:40 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>							
S	System Monitoring Compounds						
S	Tri-n-propyltin	9.37	7.71	318887	46636	418.391	314.022
				Recovery	=	83.68%	62.80%
S	Tri-n-pentyltin	16.53	13.98	266801	42516	418.285	346.574
				Recovery	=	83.66%	69.31%
<hr/>							
Target Compounds							
	Tetra-n-butyltin	9.92f	0.00	893	0	1.278	N.D. #
	Tri-n-butyltin	12.81	10.56	103878	16891	118.802	100.660
	Di-n-butyltin	15.61	12.94	12704	1613	11.913	7.496 #
	n-Butyltin	17.36	15.19f	9012	1384	6.150	4.493 #

LK  
 2-18-00  
 LN 2-22-00

## Acronyms

ASTM	American Society for Testing and Materials
A2LA	American Association for Laboratory Accreditation
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
ELAP	Environmental Laboratory Accreditation Program
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
J	Estimated concentration. The value is less than the method reporting limit, but greater than the method detection limit.
LUFT	Leaking Underground Fuel Tank
M	Modified
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons
tr	Trace level is the concentration of an analyte that is less than the PQL but greater than or equal to the MDL.

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99

Total Solids

Prep Method: NONE  
Analysis Method: 160.3M

Units: PERCENT  
Basis: Wet

Test Notes:

Sample Name	Lab Code	Date Analyzed	Result	Result Notes
C-VC-BS01-01	K2000914-001	2/9/00	79.0	
C-VC-BS01-02	K2000914-002	2/9/00	77.5	

Approved By: CR

SOLIDS.XLT\_Sample/01071998a

Date: 2/15/00

00914TS.ABI - 002 2/10/00

000143  
Reg No.

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

ient: Hart Crowser, Inc.  
ject: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 2/15/00

## Butyltins in Porewater

mple Name: HC-VC-BS01-01 Units: ug/L (ppb)  
b Code: K2000914-001 Basis: NA  
st Notes: X,G

alyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
tra-n-butyltin	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	
i-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.50	
-n-butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.07	
Butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered  
The MRL is elevated because an insufficient sample quantity was available for optimum analysis.

pproved By: VA Date: 2-22-00

12/020597p

00914SVG.AYI - 1 2/22/00

Page No.:  
**00004**

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/S930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99  
Date Porewater Extracted: 2/15/00

## Butyltins in Porewater

Sample Name: HC-VC-BS01-02  
Lab Code: K2000914-002  
Test Notes: X,G

Units: ug/L (ppb)  
Basis: NA

Analyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
Di- <i>n</i> -butyltin	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	
Tri- <i>n</i> -butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.70	
Tetra- <i>n</i> -butyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	0.07	
Pentabutyltin Cation	EPA 3520C	Krone	0.06	1	2/15/00	2/18/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered. The MRL is elevated because an insufficient sample quantity was available for optimum analysis.

Approved By:

VW

2/20597p

Date: 2-22-00

**COLUMBIA ANALYTICAL SERVICES, INC.**

## Analytical Report

ent: Hart Crowser, Inc.  
ject: POP-Terminal 5/5930  
mple Matrix: Sediment

Service Request: K2000914  
Date Collected: NA  
Date Received: NA  
Date Porewater Extracted: 2/15/00

## Butyltins in Porewater

mple Name: Method Blank Units: ug/L (ppb)  
Code: KWG2000574-4 Basis: NA  
Notes: X

alyte	Prep Method	Analysis Method	MRL	Dilution Factor	Date Extracted	Date Analyzed	Result	Result Notes
ra-n-butyltin	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
-n-butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
n-butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	
butyltin Cation	EPA 3520C	Krone	0.05	1	2/15/00	2/17/00	ND	

Porewater generated in accordance with DDMP guidelines, ACOE Seattle District, August 1998; unfiltered

pproved By: VR Date: 2-22-00

2/020597p

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Collected: 11/22/99  
Date Received: 11/29/99

## Duplicate Summary

## Total Solids

Prep Method: NONE  
Analysis Method: 160.3M  
Test Notes:

Units: PERCENT  
Basis: Wet

Sample Name	Lab Code	Date Analyzed	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference	Result Notes
C-VC-BS01-01	K2000914-001DUP	2/9/00	79.0	77.8	78.4	2	

Approved By: CC

Date: 2/15/00

DLIDS.XLT\_DUP/09291998a

00914TS.ABI - DUP 2/10/00

00007

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Collected:** 11/22/99  
**Date Received:** 11/29/99  
**Date Extracted:** 2/15/00  
**Date Analyzed:** 2/17 - 18/00

## Surrogate Recovery Summary Butyltins in Porewater

Prep Method: EPA 3520C Units: PERCENT  
Analysis Method: Krone Basis: NA

Sample Name	Lab Code	Test Notes	Percent Recovery	
			Tri-n-propyltin Cation	Tri-n-pentyltin Cation
HC-VC-BS01-01	K2000914-001		88	86
HC-VC-BS01-02	K2000914-002		84	84
Batch QC	K2001000-003		86	85
Batch QC	K2001000-003MS		80	76
Batch QC	K2001000-003DMS		84	82
Lab Control Sample	KWG2000574-3		91	86
Method Blank	KWG2000574-4		81	90

CAS Acceptance Limits: 21-107 21-116

Approved By: VW  
SUR2/111397p

Date: 2-22-00

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K2000914  
 Date Collected: NA  
 Date Received: NA  
 Date Extracted: 2/15/00  
 Date Analyzed: 2/17/00

Matrix Spike/Duplicate Matrix Spike Summary  
 Butyltins in Porewater

Sample Name: Batch QC Units: ug/L (ppb)  
 Job Code: K2001000-003MS, Basis: NA  
 Test Notes:

Analyte	Prep Method	Analysis Method	Percent Recovery										
			Spike Level		Sample		Spike Result		CAS Acceptance		Relative Percent		
			MRL	MS	DMS	Result	MS	DMS	MS	DMS	Acceptance Limits	Percent Difference	Result Notes
Estra-n-butyltin	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.7	0.7	70	70	20-116	<1	
i-n-butyltin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.9	0.9	90	90	20-116	<1	
i-n-butyltin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	0.7	0.7	70	70	20-116	<1	
Butyltin Cation	EPA 3520C	Krone	0.05	1.0	1.0	ND	1.0	0.9	100	90	20-116	11	

Approved By: VW  
 IS/020597p

Date: 2-22-00

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
LCS Matrix: Sediment

Service Request: K2000914  
Date Collected: NA  
Date Received: NA  
Date Extracted: 2/15/00  
Date Analyzed: 2/17/00

**Laboratory Control Sample Summary  
Butyltins in Porewater**

Sample Name: Lab Control Sample  
Lab Code: KWG2000574-3  
Test Notes:

Units: ug/L (ppb)  
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS	Result Notes
						Percent Recovery	
Tetra-n-butyltin	EPA 3520C	Krone	0.50	0.40	80	23-131	
Tri-n-butyltin Cation	EPA 3520C	Krone	0.50	0.47	94	23-131	
Di-n-butyltin Cation	EPA 3520C	Krone	0.50	0.41	82	16-118	
n-Butyltin Cation	EPA 3520C	Krone	0.50	0.48	96	17-128	

Approved By: VNDate: 2-22-00

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
Sample Matrix: Sediment

Service Request: K2000914  
Date Analyzed: 2/17/00

Continuing Calibration Verification (CCV) Summary  
Butyltins in Porewater

Sample Name: CCV1  
Lab Code: 0217F010  
Test Notes:

Units: ug/L (ppb)  
Basis: NA

Analyte	Analysis Method	True Value	Result	CAS		Result Notes
				Acceptance Limits	Percent Recovery	
Tetra-n-butyltin	Krone	490	527	368-613	108	
Tri-n-butyltin Cation	Krone	475	509	356-594	107	
Di-n-butyltin Cation	Krone	510	533	383-638	105	
n-Butyltin Cation	Krone	492	513	369-615	104	

Approved By: VN

CCV1/021397p

Date: 2-22-00

**COLUMBIA ANALYTICAL SERVICES, INC.**

## QA/QC Report

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Analyzed:** 2/18/00

**Continuing Calibration Verification (CCV) Summary**  
**Butyltins in Porewater**

**Sample Name:** CCV2   **Units:** ug/L (ppb)  
**Lab Code:** 0217F023   **Basis:** NA  
**Test Notes:**

<b>Analyte</b>	<b>Analysis Method</b>	<b>True Value</b>	<b>Result</b>	<b>CAS Acceptance Limits</b>		<b>Percent Recovery</b>	<b>Result Notes</b>
				368-613	356-594		
Tetra-n-butyltin	Krone	490	510	368-613	356-594	104	
Tri-n-butyltin Cation	Krone	475	502	368-613	356-594	106	
Di-n-butyltin Cation	Krone	510	518	383-638	369-615	102	
n-Butyltin Cation	Krone	492	501	383-638	369-615	102	

Approved By: VN Date: 2-22-00

CCV/021397p

009145VGAYI - CCV2 2/22/00

00012

**COLUMBIA ANALYTICAL SERVICES, INC.****QA/QC Report**

**Client:** Hart Crowser, Inc.  
**Project:** POP-Terminal 5/5930  
**Sample Matrix:** Sediment

**Service Request:** K2000914  
**Date Analyzed:** 2/18/00

**Continuing Calibration Verification (CCV) Summary**  
**Butyltins in Porewater**

**Sample Name:** CCV3  
**Lab Code:** 0217F036  
**Test Notes:**

**Units:** ug/L (ppb)  
**Basis:** NA

<b>Analyte</b>	<b>Analysis Method</b>	<b>True Value</b>	<b>Result</b>	<b>CAS</b>		<b>Result Notes</b>
				<b>Acceptance Limits</b>	<b>Percent Recovery</b>	
Tetra-n-butyltin	Krone	490	512	368-613	104	
Tri-n-butyltin Cation	Krone	475	485	356-594	102	
Di-n-butyltin Cation	Krone	510	513	383-638	101	
n-Butyltin Cation	Krone	492	510	369-615	104	

Approved By: VW Date: 2-22-00  
CCV/021397p

## EPA Method 160.3 - Total Solids

WORKGROUP: KWG2000494

Analyst: ABaird

Reviewed By: CG

Date Acquired: 9 Feb 00 04:10 PM

Date Reviewed: 2/15/00

Date Completed: 10 Feb 00 10:17 AM

OvenTemp: 105

#	Lab Code	Tare	Wet Wt	Tare+Dry	Dry Wt	% Solids	Description	Matrix	Sample Name	QC Ref Sample
1	JK2000914-001	1.0100	10.5000	9.3000	8.2900	79.0		TS-MET	TS	
2	JK2000914-002	1.0200	10.6100	9.2400	8.2200	77.5		TS-MET	TS	
3	JK2000921-001	1.0100	11.8900	11.3200	10.3100	86.7		TS-MET	TS	
4	JK2000921-002	1.0200	11.4400	11.2200	10.2000	89.2		TS-MET	TS	
5	JK2000921-006	1.0200	10.6700	9.2800	8.2600	77.4		TS-MET	TS	
6	JK2000921-008	1.0300	10.4800	9.0000	7.9700	76.0		TS-MET	TS	
7	JK2000921-012	1.0200	10.4400	10.2600	9.2400	88.5		TS-MET	TS	
8	KWG2000494-1	1.0300	11.3500	9.8600	8.8300	77.8		TS-MET	TS	K2000914-001
9	KWG2000494-2	1.0200	10.7000	10.2600	9.2400	86.4		TS-MET	TS	K2000921-001

00014

## COLUMBIA ANALYTICAL SERVICES, INC.

K2000914

Service Request No.: K2000723R/K2001000

Date Extracted: 2/15/00

Analyst: Karina Gress

Extraction lot: KWG: 2000574

## Organotins in Water

Lab ID	Client ID	Sample Volume	pH	Surf	MS	Der	HCl	C-U	Final Volume
723-723	IR174BCD0A	315	4.2	50mL	—	2mL	2mL	3mL	0.5mL
200-1	HC-L02-C67	260			—				
2	HC-L03-PB	250			—				
3	HC-L03-L00	250			—				
3mL		250			50mL				
3DMS	↓	250			↓				
14-1	HC-VL-B501-01	88			—				
1-2	HC-VL-B501-02	85			—				
15 WL	Lab Control	500			50mL				
WB	Method Blank	500			—				
PB	Porewater Blank	500			—				
000-4	HC-L03-C01	230	↓	↓	—	↓	↓	↓	↓
Karen Gress	02	500				→ LK 2-16-00 → LK 2-17-00 →			

Comments:

Standard batch: 82 Hexane lot # 3923 Pentane lot # BP704 DCM lot # 39243

Start Time/Date/Initial: 4:53pm/2/15/00/KG Stop Time/Date/Initial: 11:35AM/2/16/00/KG

Surrogate ID: OT2-72-C/5ppm/50mL/EppC/Exp 031902

Sample ID: OT2-73-C/5ppm/50mL/EppC/Exp 032100

Color: Blue Extract Storage: NA Extract Received: LK 2-17-00

Witnessed By: Jim Kennedy Date: 2-15-00

viewed By: LK Date: 2-18-00

## COLUMBIA ANALYTICAL SERVICES, INC.

## Water / Liquid

DRKGROUP: KWG2000574

Prep Method: 3520B

alyst: kgress

Date Extracted: 15 Feb 00 08:59 AM

Proximate Added(ul):

Spike Added(ul):

Comments:

Lab Code	Client ID	Sample Vol	SS	pH B/N	pH Acid	Final Vol	Surr ID	Surr EXP	Spike ID
2000723-023	JIR17WB070A	315.000				0.500			
2000914-001	JHC-VC-BS01-01	88.000				0.500			
2000914-002	JHC-VC-BS01-02	85.000				0.500			
2001000-001	JHC-L02-C07	260.000				0.500			
2001000-002	JHC-L03-PB	250.000				0.500			
2001000-003	JHC-L03-LW	250.000				0.500			
2001000-004	JHC-L03-C01	230.000				0.500			
VG2000574-1	Method Blank	500.000				0.500			
VG2000574-2	Matrix Spike	250.000				0.500			
VG2000574-2	Matrix Spike	250.000				0.500			
VG2000574-3	Duplicate Matrix Spi	250.000				0.500			
VG2000574-4	Lab Control Sample	500.000				0.500			
VG2000574-5	Method Blank	500.000				0.500			
						0.500			

00016

## **COLUMBIA ANALYTICAL SERVICES, INC.**

Service Request No.: R26906914

Date Extracted:

Analyst: Karinace Gress

#### **HOLD TIME FOR ORGANOTIN EXTRACTION:**

2102108

## Interstitial / Pore Water Extraction

## Comments:

NA

**■ Facts Filtered? (Circle one)**

EXTRACT STORAGE: Samson 93

Witnessed By: NA

Date:

viewed By: ✓

Date: 2-18-08

Signal #1 : J:\GC11\DATA\021700\0217F024.D  
 Acq On : 18 Feb 00 01:28 AM  
 Sample : K2000914-001 | HC-VC-BS01-01  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88

Vial: 14  
 Operator: lkennedy  
 Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
 Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
 Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 88

$$\text{Conversion Factor} = (F \times D) / = 0.005682$$

Volume Inj. : 3  $\mu$ L

Signal #1 : RTX-50

Signal #2 : RTX-200

*Raised MRL to 0.06 ng/mL G*

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Solution		Rec#1	Rec#2
							Conc#1	Conc#2		
Tetra-n-propyltin	9.38	7.71	336349	49280	441.3	331.8	88.26	66.37	%	%
Tri-n-pentyltin	16.53	13.99	274162	43568	429.8	355.1	85.97	71.03	%	%

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Solution		Original		
							Conc#1	Conc#2	Conc#1	Conc#2	Units
Tetra-n-butyltin	9.90	0.00	1912	0	2.7	0.0	0.016	0.000	0.005	0.000	ppb
Tri-n-butyltin	12.81	10.57	77227	12881	88.3	76.8	0.502	0.436	0.205	0.178	ng/ml
Di-n-butyltin	15.61	12.94	13054	858	12.2	94.0	ND	0.070	0.035	0.012	ng/ml
n-Butyltin	17.36	15.26	14424	1412	9.8	4.6	0.056	0.026	0.038	0.018	ng/ml

Analytes as Sn	Sn Conversion Factors				
	0.3419	0.4092	0.5095	0.6751	
Tetra-n-butyltin					0.005 0.000 ng/ml
Tri-n-butyltin					0.205 0.178 ng/ml
Di-n-butyltin					0.035 0.012 ng/ml
n-Butyltin					0.038 0.018 ng/ml

*UK  
2/18/00*

ORIG CONC (< 0) are considered ND - None Detected

0217F024.D TINS.MTH

*VN  
2.22.00*

00018

Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>							
	System Monitoring Compounds						
) S	Tri-n-propyltin	9.38	7.71	336349	49280	441.302	331.826
)				Recovery	=	88.26%	66.37%
) S	Tri-n-pentyltin	16.53	13.99	274162	43568	429.825	355.150
)				Recovery	=	85.97%	71.03%
<hr/>							
Target Compounds							
)	Tetra-n-butyltin	9.90f	0.00	1912	0	2.736	N.D. #
)	Tri-n-butyltin	12.81	10.57	77227	12881	88.322	76.762
)	Di-n-butyltin	15.61	12.94	13054	858	12.242	3.988 #
)	n-Butyltin	17.36	15.26	14424	1412	9.844	4.584 #

LF  
2/18/00

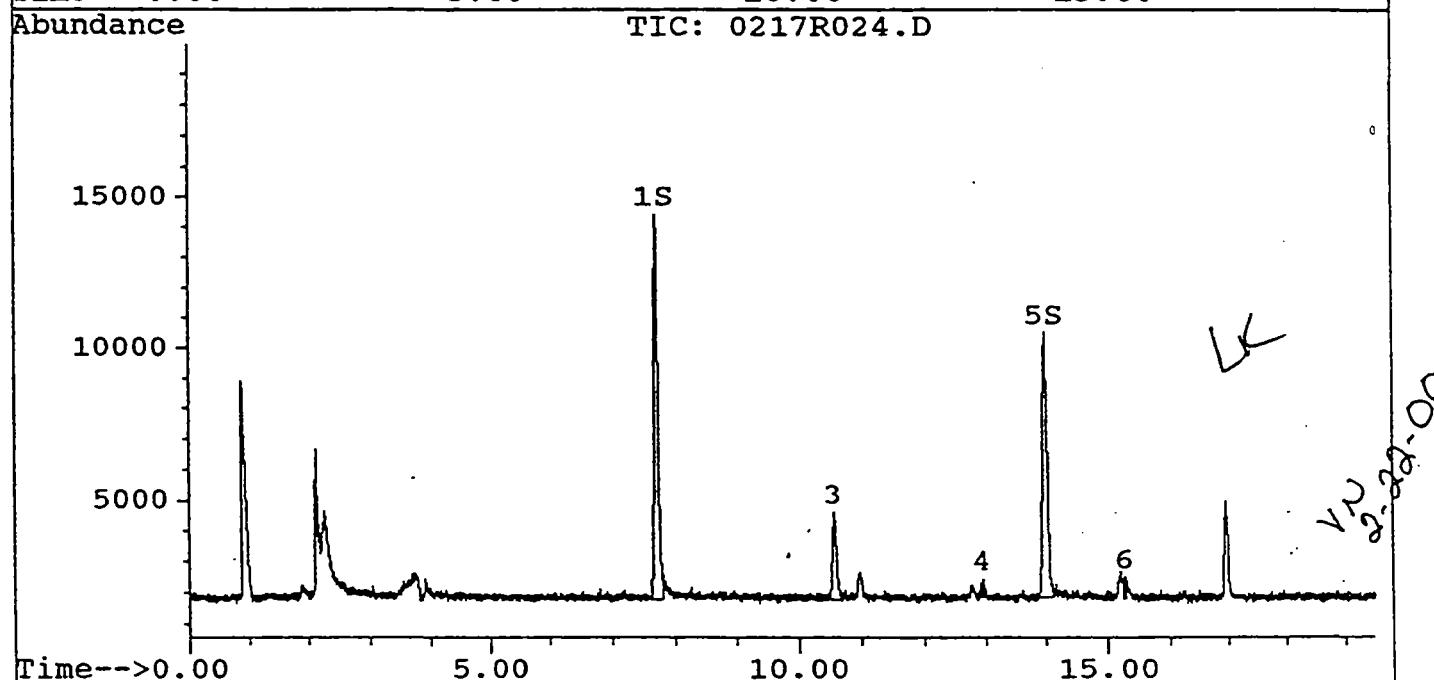
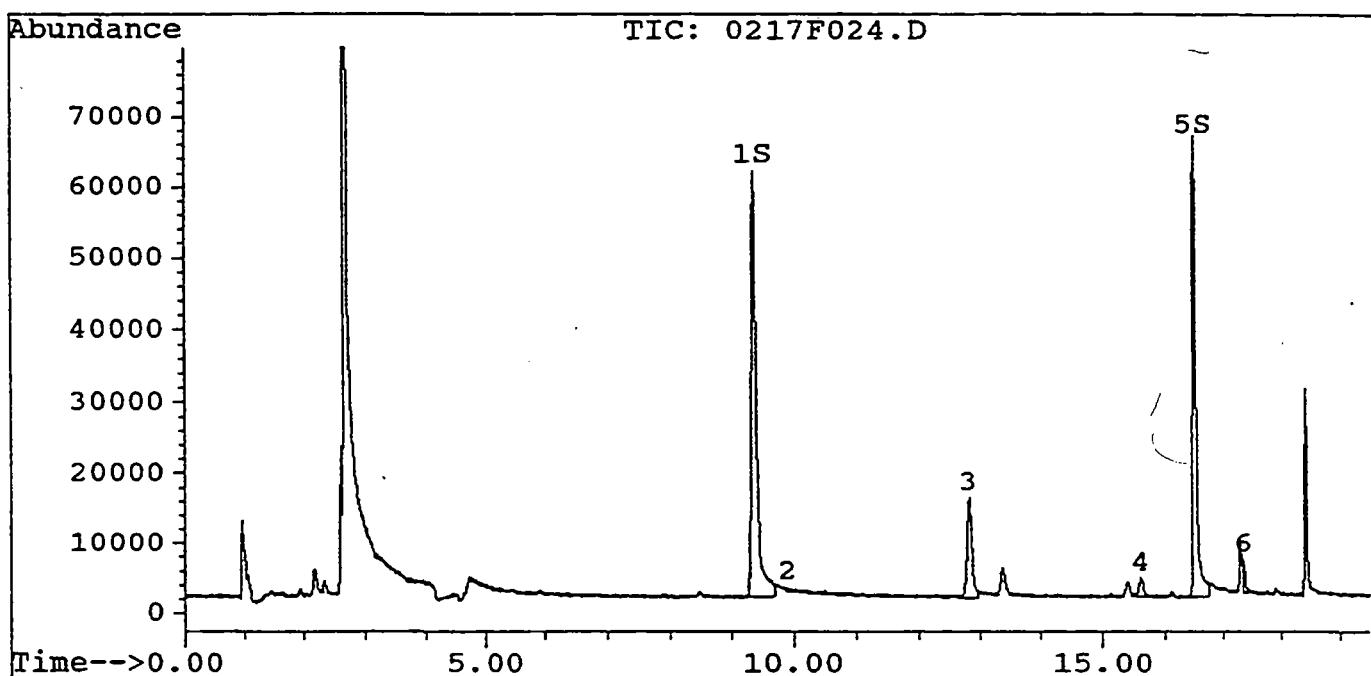
VJ 2/22/00

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D Operator: lkennedy  
 Acq On : 18 Feb 00 01:28 AM Inst : GC11  
 Sample : K2000914-001 | HC-VC-BS01-01  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

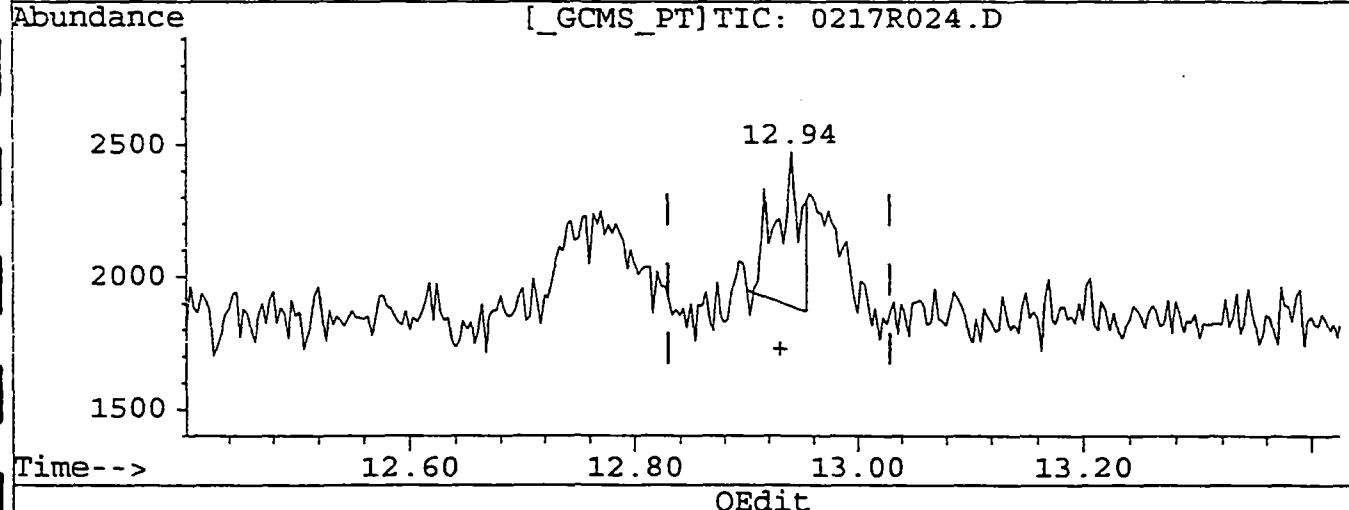
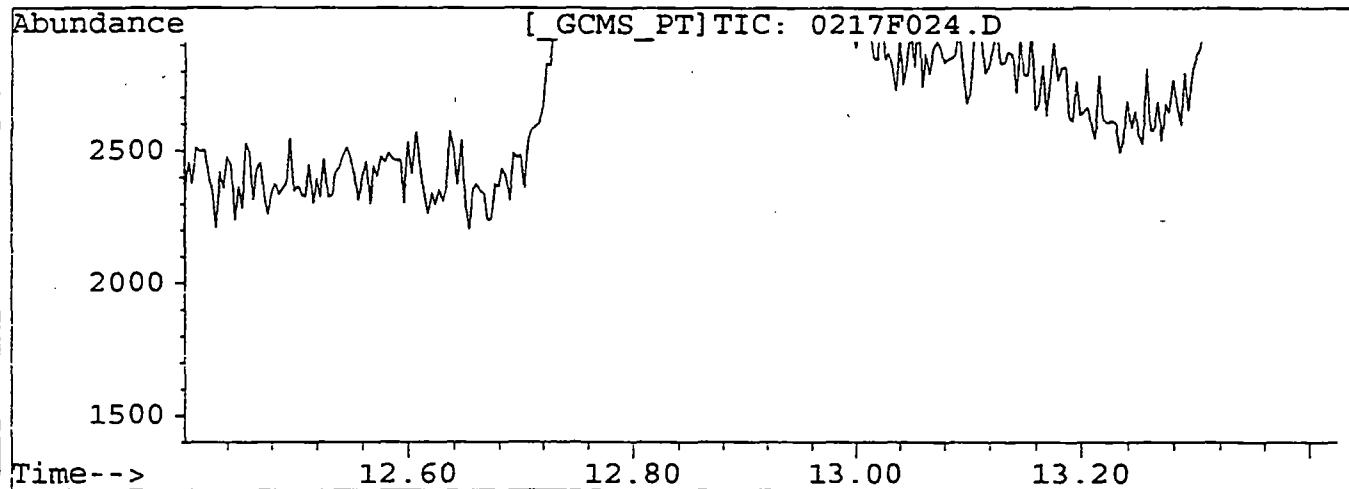
Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.



Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Tue Feb 22 08:37:56 2000  
 Response via : Multiple Level Calibration



QEdit

(4) Di-n-butyltin

15.61min 12.24ng/ml

response 13054

(4) Di-n-butyltin #2

12.94min 3.99ng/ml

response 858

*before*  
12.22 12.94

(+) = Expected Retention Time

0217F024.D 0209TINS.M

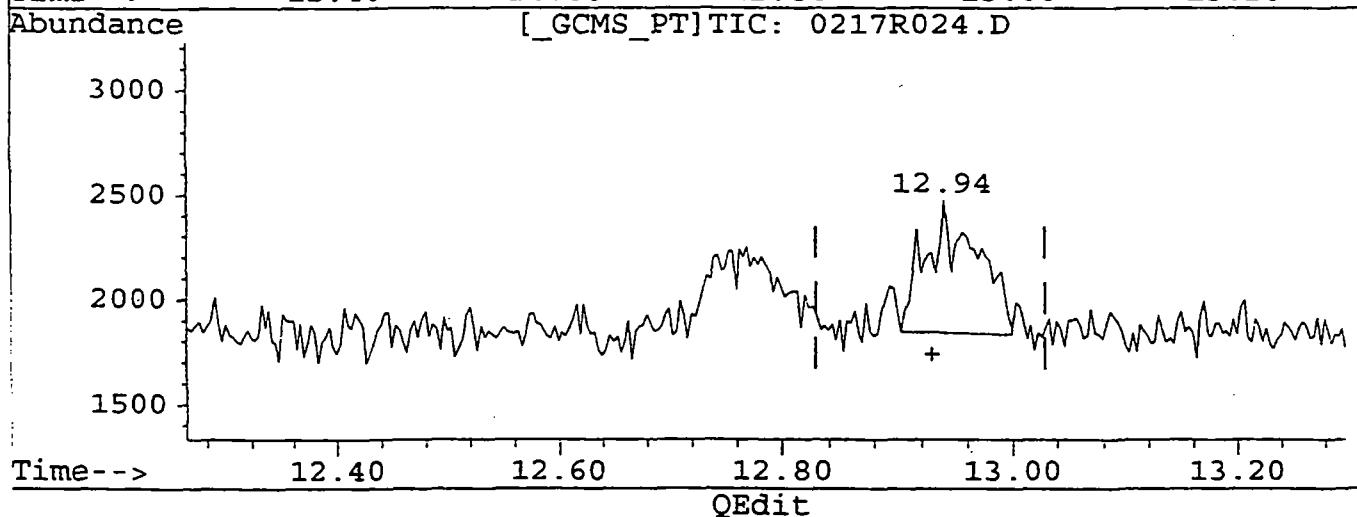
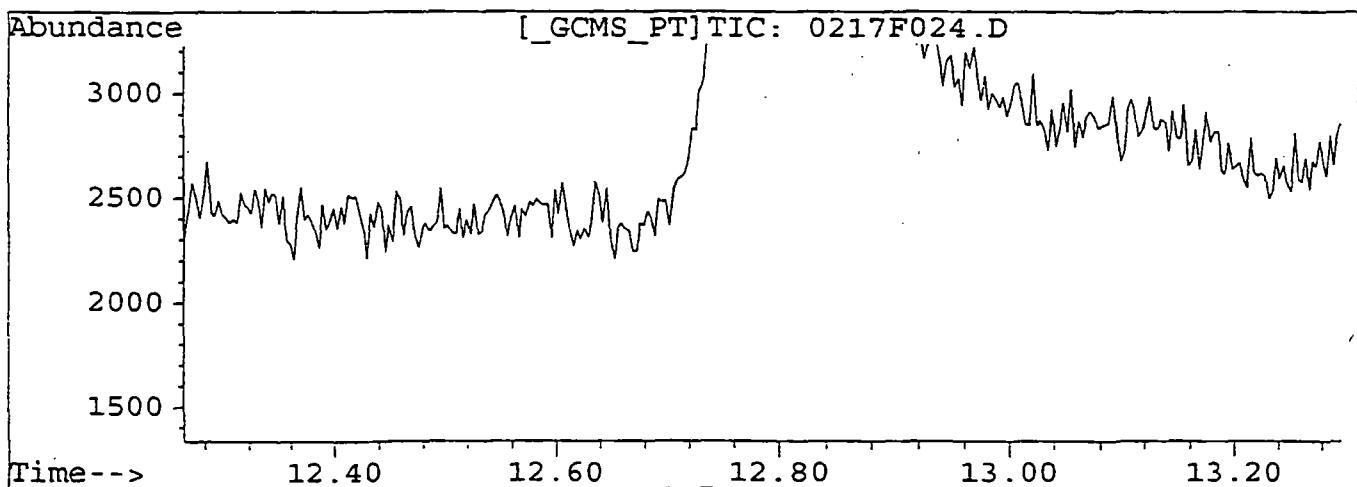
Tue Feb 22 09:24:16 2000

00021

Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F024.D Vial: 14  
 Signal #2 : J:\GC11\DATA\021700\0217F024.D\0217R024.D  
 Acq On : 18 Feb 00 01:28 AM Operator: lkennedy  
 Sample : K2000914-001 | HC-VC-BS01-01 Inst : GC11  
 Misc : SVG\PORE-TIN\00914001.H | F=.5 D=1 A=88 Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Tue Feb 22 08:37:56 2000  
 Response via : Multiple Level Calibration



(4) Di-n-butyltin  
 15.61min 12.24ng/ml  
 response 13054

(4) Di-n-butyltin #2  
 12.94min 8.97ng/ml m  
 response 1930

(+) better confirmation  
 VU 2/22/00

Signal #1 : J:\GC11\DATA\021700\0217F025.D  
 Acq On : 18 Feb 00 01:52 AM  
 Sample : K2000914-002 | HC-VC-BS01-02  
 Misc : SVG\PORE-TIN\00914002.H | F=.5 D=1 A=85 ✓

Vial: 15  
 Operator: lkennedy  
 Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
 Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
 Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 85

Conversion Factor = (F x D) / = 0.005882

Volume Inj. : 3 µL  
 Signal #1 : RTX-50  
 Signal #2 : RTX-200

*Raised m/e 0.06 ug/L G*

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2	
1) Tri-n-propyltin	9.37	7.71	318887	46636	418.4	314.0	83.68	62.80	%
5) Tri-n-pentyltin	16.53	13.98	266801	42516	418.3	346.6	83.66	69.31	%

Solution

Original

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Conc#1	Conc#2	Units
1) Tetra-n-butyltin	9.92	0.00	893	0	1.3	0.0	0.008	0.000	ppb
1) Tri-n-butyltin	12.81	10.56	103878	16891	118.8	100.7	0.699	0.592	ppb
1) Di-n-butyltin	15.61	12.94	12704	1613	11.9	7.5	0.070	0.044	ppb
1) n-Butyltin	17.36	15.19	9012	1384	6.2	4.5	0.036	0.026	ppb

Analytes as Sn

Sn Conversion Factors

Tetra-n-butyltin	0.3419	0.003	0.000	ng/ml
Tri-n-butyltin	0.4092	0.286	0.242	ng/ml
Di-n-butyltin	0.5095	0.036	0.022	ng/ml
n-Butyltin	0.6751	0.024	0.018	ng/ml

*UK  
2-18-00  
2-22-00*

ORIG CONC (< 0) are considered ND - None Detected

0217F025.D TINS.MTH

00023

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F025.D Vial: 15  
 Signal #2 : J:\GC11\DATA\021700\0217F025.D\0217R025.D  
 Acq On : 18 Feb 00 01:52 AM Operator: lkennedy  
 Sample : K2000914-002 | HC-VC-BS01-02 Inst : GC11  
 Misc : SVG\PORE-TIN\00914002.H | F=.5 D=1 A=85 Multiplr: 1.00  
 Quant Time: Feb 18 9:40 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50	Signal #2 Phase: RTX-200
Signal #1 Info : 0.53mm id	Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
----------	------	------	--------	--------	-------	-------

**System Monitoring Compounds**

S	Tri-n-propyltin	9.37	7.71	318887	46636	418.391	314.022
				Recovery	=	83.68%	62.80%
S	Tri-n-pentyltin	16.53	13.98	266801	42516	418.285	346.574
				Recovery	=	83.66%	69.31%

**Target Compounds**

Tetra-n-butyltin	9.92f	0.00	893	0	1.278	N.D. #
Tri-n-butyltin	12.81	10.56	103878	16891	118.802	100.660
Di-n-butyltin	15.61	12.94	12704	1613	11.913	7.496 #
n-Butyltin	17.36	15.19f	9012	1384	6.150	4.493 #

LK  
2-18-00  
VN 2.22.00

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

Client: Hart Crowser, Inc.  
 Project: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99  
 Date Extracted: 12/1/99  
 Date Analyzed: 12/4-6/99

Surrogate Recovery Summary  
 Base Neutral/Acid Semivolatile Organic Compounds

Prep Method: EPA 3550B  
 Analysis Method: SIM

Units: PERCENT  
 Basis: NA

Sample Name	Lab Code	Test Notes	2FPHL	P e r c e n t	R e c o v e r y		
			PHLD6	NBZ	2FBPH	246TBPML	TPH
C-BS01-C1	K9908537-001		55	66	60	58	60
C-BS01-BARGE-C1	K9908537-006		47	54	58	71	60
C-BS03-C1	K9908537-010		37	44	39	56	76
C-BS01-BARGE-C1	K9908537-006MS		53	60	58	68	73
C-BS01-BARGE-C1	K9908537-006DMS		56	63	61	74	82
ab Control Sample	KWG9904280-7		67	73	69	73	69
Method Blank	KWG9904280-8		61	70	69	79	53
							114

CAS Acceptance Limits: 31-106 37-104 22-123 15-117 12-116 19-140

·PHL

2-Fluorophenol

·HL6

Phenol-d6

·BZ

Nitrobenzene-d5

·BPH

2-Fluorobiphenyl

·6TBPML

2,4,6-Tribromophenol

·H

p-Terphenyl-d14

Approved By:

(Haines)

Date:

DEC 17 1999

## COLUMBIA ANALYTICAL SERVICES, INC.

## QA/QC Report

to: Hart Crowser, Inc.  
 to: POP-Terminal 5/5930  
 Sample Matrix: Sediment

Service Request: K9908537  
 Date Collected: 11/22/99  
 Date Received: 11/29/99  
 Date Extracted: 12/1/99  
 Date Analyzed: 12/4-16/99

Matrix Spike/Duplicate Matrix Spike Summary  
 Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: HC-BS01-BARGE-C1  
 Code: K9908537-006MS, K9908537-006DMS  
 Notes:

Units: ug/Kg (ppb)  
 Basis: Dry

Analyte	Prep Method	Analysis Method	Spike Level				Sample Result	Spike Result		MS	DMS	CAS Advisory Limits	Relative Percent Difference	Result Notes
			MRL	MS	DMS			MS	DMS					
o	EPA 3550B	SIM	10	150	150	ND	87	99	58	66	20-99	13		
o-chlorobenzene	EPA 3550B	SIM	10	150	150	ND	99	110	66	73	10-109	11		
-Trichlorobenzene	EPA 3550B	SIM	10	150	150	ND	110	130	73	87	21-100	17		
aphthene	EPA 3550B	SIM	6	150	150	ND	110	120	73	80	26-104	9		
o-chlorophenol	EPA 3550B	SIM	10	150	150	ND	110	130	73	87	10-145	17		
ne	EPA 3550B	SIM	6	150	150	ND	160	150	107	100	18-144	6		

Reviewed By: \_\_\_\_\_ Date: \_\_\_\_\_  
 152995

DEC 17 1999

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Page No.: \_\_\_\_\_

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: Hart Crowser, Inc.  
Project: POP-Terminal 5/5930  
LCS Matrix: Sediment

Service Request: K9908537  
Date Collected: NA  
Date Received: NA  
Date Extracted: 12/1/99  
Date Analyzed: 12/4-16/99

Laboratory Control Sample Summary  
Base Neutral/Acid Semivolatile Organic Compounds

Sample Name: Lab Control Sample  
Lab Code: KWG9904280-7  
Test Notes:

Units: ug/Kg (ppb)  
Basis: NA

Analyte	Prep Method	Analysis Method	True Value	Percent Recovery		CAS Percent Recovery Advisory	Result Notes
				Result	Recovery		
Phenol	EPA 3550B	SIM	220	170	77	21-110	
1,4-Dichlorobenzene	EPA 3550B	SIM	220	160	73	37-93	
1,2,4-Trichlorobenzene	EPA 3550B	SIM	220	180	82	10-108	
Acenaphthene	EPA 3550B	SIM	220	160	73	29-109	
Pentachlorophenol	EPA 3550B	SIM	220	180	82	10-120	
Pyrene	EPA 3550B	SIM	220	190	86	39-149	

Approved By: \_\_\_\_\_

LCS/52595  
085375VMA.Y1 - Ics 12/17/99

(Haines)

Date: \_\_\_\_\_

DEC 17 1999

00078  
Page No.: \_\_\_\_\_

# **APPENDIX B**

## **CHAIN OF CUSTODY**

### **INFORMATION**

00079

PROJECT NAME	POP-Terminal TS				NUMBER OF CONTAINERS	TESTS REQUESTED																					
PROJECT NUMBER	5930					<input type="checkbox"/> Metals (list below)	<input checked="" type="checkbox"/> Total Volatile Solids	<input checked="" type="checkbox"/> TOC (ASTM D4129M)	<input checked="" type="checkbox"/> Grain size - PSEP / ASTM D422	<input checked="" type="checkbox"/> Sulfide - Total (9030M)	<input checked="" type="checkbox"/> AVS / SEM	<input checked="" type="checkbox"/> Ammonia	<input checked="" type="checkbox"/> Total (350.1m)	<input checked="" type="checkbox"/> Pesticides (8081)	<input checked="" type="checkbox"/> PCBs (8082)	<input checked="" type="checkbox"/> Aroclors	<input checked="" type="checkbox"/> Semivolatiles (GC/MS SIM)	<input checked="" type="checkbox"/> Organotin - Sediment	<input checked="" type="checkbox"/> Organotin - Mono	<input checked="" type="checkbox"/> Organotin - Di	<input checked="" type="checkbox"/> Organotin - Pore water	<input checked="" type="checkbox"/> PCBMA - GC/MS	<input checked="" type="checkbox"/> TB7 Pore water	<input checked="" type="checkbox"/> PCB7205 / PCB			
PROJECT MANAGER	Howard Cumberland					<input type="checkbox"/> Total Solids	<input type="checkbox"/> Lipids	<input type="checkbox"/> 1621U	<input type="checkbox"/> Total / ASTM D422	<input type="checkbox"/> Water Soluble	<input type="checkbox"/> AVS / SEM	<input type="checkbox"/> Total (350.1m)	<input type="checkbox"/> Pesticides (8081)	<input type="checkbox"/> PCBs (8082)	<input type="checkbox"/> Aroclors	<input type="checkbox"/> Semivolatiles (GC/MS SIM)	<input type="checkbox"/> Organotin - Sediment	<input type="checkbox"/> Organotin - Mono	<input type="checkbox"/> Organotin - Di	<input type="checkbox"/> Organotin - Pore water	<input type="checkbox"/> PCBMA - GC/MS	<input type="checkbox"/> TB7 Pore water	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB		
COMPANY/ADDRESS	7407 (Rowena / Fluo Contaminants In Supe 240 LAKE OSWEGO, OR 97035					<input type="checkbox"/> Lipids	<input type="checkbox"/> 1621U	<input type="checkbox"/> 1621U	<input type="checkbox"/> Water Soluble	<input type="checkbox"/> AVS / SEM	<input type="checkbox"/> Total (350.1m)	<input type="checkbox"/> Pesticides (8081)	<input type="checkbox"/> PCBs (8082)	<input type="checkbox"/> Aroclors	<input type="checkbox"/> Semivolatiles (GC/MS SIM)	<input type="checkbox"/> Organotin - Sediment	<input type="checkbox"/> Organotin - Mono	<input type="checkbox"/> Organotin - Di	<input type="checkbox"/> Organotin - Pore water	<input type="checkbox"/> PCBMA - GC/MS	<input type="checkbox"/> TB7 Pore water	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB			
PHONE #	503-620-7284					<input type="checkbox"/> 1621U	<input type="checkbox"/> 1621U	<input type="checkbox"/> 1621U	<input type="checkbox"/> Water Soluble	<input type="checkbox"/> AVS / SEM	<input type="checkbox"/> Total (350.1m)	<input type="checkbox"/> Pesticides (8081)	<input type="checkbox"/> PCBs (8082)	<input type="checkbox"/> Aroclors	<input type="checkbox"/> Semivolatiles (GC/MS SIM)	<input type="checkbox"/> Organotin - Sediment	<input type="checkbox"/> Organotin - Mono	<input type="checkbox"/> Organotin - Di	<input type="checkbox"/> Organotin - Pore water	<input type="checkbox"/> PCBMA - GC/MS	<input type="checkbox"/> TB7 Pore water	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB			
SAMPLER'S SIGNATURE	Dawn Hamill					<input type="checkbox"/> 1621U	<input type="checkbox"/> 1621U	<input type="checkbox"/> 1621U	<input type="checkbox"/> AVS / SEM	<input type="checkbox"/> Total (350.1m)	<input type="checkbox"/> Pesticides (8081)	<input type="checkbox"/> PCBs (8082)	<input type="checkbox"/> Aroclors	<input type="checkbox"/> Semivolatiles (GC/MS SIM)	<input type="checkbox"/> Organotin - Sediment	<input type="checkbox"/> Organotin - Mono	<input type="checkbox"/> Organotin - Di	<input type="checkbox"/> Organotin - Pore water	<input type="checkbox"/> PCBMA - GC/MS	<input type="checkbox"/> TB7 Pore water	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB	<input type="checkbox"/> PCB7205 / PCB				
SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX																							
HC-B501-C1	11-22-99	1500	1	SPD		2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			
HC- <del>B501</del> -B501-01		1050	2			1																					
HC-VC-B501-02		1403	3			1																					
HC-VC-B501-21		1050	4		2																						
HC-VC-B501-22		1403	5		2																						
HC-B501-B126ecu		1207	6		2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
HC-B501-BARGE-21		1207	7		2																						
HC-VC-B503-01		1543	8		1																						
HC-VC-B503-02		1447	9		1																						
HC-B503-C1	V	1600	10	1/2		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					

#### REPORT REQUIREMENTS

- I. Routine Report: Method Blank, Surrogate, as required
- II. Report Dup., MS, MSD as required
- III. Data Validation Report (includes all raw data)
- IV. CLP Deliverable Report
- V. EDD

#### INVOICE INFORMATION

P.O. # \_\_\_\_\_

BILL To: \_\_\_\_\_

Circle which metals are to be analyzed:

SMS Metals: As Cd Cr Cu Pb Hg Ag Zn Se  
 CA Metals: Ag As Cd Cr Cu Hg Ni Pb Zn 5b

#### TURNAROUND REQUIREMENTS

24 hr.      48 hr.

5 Day

Standard (10-15 working days)

Provide FAX Results

Requested Report Date

#### SPECIAL INSTRUCTIONS/COMMENTS:

(X) Spec ATTACHED L2ST.  
 AS per LCRMIA.

CT = 1.8

RELINQUISHED BY:  
 KENNY KRISTEN 11/29 1050  
 Signature: KENNY KRISTEN Date/Time: 1050  
 Printed Name: KENNY KRISTEN Firm: HC

RELINQUISHED BY:  
 R. Boehme 11/29 1050  
 Signature: R. Boehme Date/Time: 1050  
 Printed Name: R. Boehme Firm: HC

RELINQUISHED BY:  
 11/29/99 3:20  
 Signature: J. Montalvo Date/Time: 3:20  
 Printed Name: J. Montalvo Firm: car

RELINQUISHED BY:  
 11/29/99 3:20  
 Signature: R. Boehme Date/Time: 3:20  
 Printed Name: R. Boehme Firm: HC

PROJECT NAME	POP - PRMZNAC 5				NUMBER OF CONTAINERS  Metals (list below) <input type="checkbox"/> Total Volatile Solids <input type="checkbox"/> Total Solids TOC (ASTM D4129M) Grain size - PSEP / ASTM D422 Sulfide <input type="checkbox"/> Total (9030M) AVS / SEM Ammonia <input type="checkbox"/> Total (350, 1m) Pesticides (8081) PCBs (8082) Aroclors Semivolatiles <input type="checkbox"/> PAHs <input type="checkbox"/> Organotin - Sediment <input type="checkbox"/> Mono <input type="checkbox"/> Di <input type="checkbox"/> Tri <input type="checkbox"/> Tetra Volatileles (8260) TRPH 8015 / 418.1	REMARKS  <i>2CH2Oue</i>
PROJECT NUMBER	5930					
PROJECT MANAGER	HOWARD CUMBERLAND					
COMPANY/ADDRESS	HAR CUMBERLAND / FINE CHEMICALS P.O. Box 240 Lake Oswego OR 97035					
PHONE #	503-620-7284	FAX #	503-620-6918			
SAMPLER'S SIGNATURE	<i>Dawn Hant</i>					
SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX		
HC-VC-B503-21	11-22-94	1545	11	SPD		
HC-VC-B503-22	11-22-94	1447	12	SPD	1	

REPORT REQUIREMENTS	INVOICE INFORMATION		Circle which metals are to be analyzed:  SMS Metals: As Cd Cr Cu Pb Hg Ag Zn CA Metals: Ag- As Cd Cr Cu Hg Ni Pb Se Zn
	P.O. #	BILL To:	
I. Routine Report: Method Blank, Surrogate, as required  II. Report Dup., MS, MSD as required  III. Data Validation Report (Includes all raw data)  IV. CLP Deliverable Report  V. EDD	TURNAROUND REQUIREMENTS		SPECIAL INSTRUCTIONS/COMMENTS:
	24 hr.	48 hr.	
	5 Day	Standard (10-15 working days)	
	Provide FAX Results		
	Requested Report Date		

RELINQUISHED BY:  <i>Karen Hunter</i> Signature Printed Name Date/Time Firm	RELINQUISHED BY:  <i>R. Bachmeier</i> Signature Printed Name Date/Time Firm	RELINQUISHED BY:  <i>R. Bachmeier</i> Signature Printed Name Date/Time Firm	RELINQUISHED BY:  <i>R. Bachmeier</i> Signature Printed Name Date/Time Firm
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Columbia Analytical Services Inc.  
Cooler Receipt And Preservation Form

Project/Client Hart Crowser Work Order K99 8537

Cooler received on 11/30/99 and opened on 11/30/99 by MW

1. Were custody seals on outside of cooler?  
If yes, how many and where? courier YES  NO
2. Were seals intact and signature & date correct? YES  NO
3. COC # \_\_\_\_\_
- Temperature of cooler(s) upon receipt: 1.8 \_\_\_\_\_
- Temperature Blank: \_\_\_\_\_
4. Were custody papers properly filled out (ink, signed, etc.)? YES  NO
5. Type of packing material present b. wrap YES  NO
6. Did all bottles arrive in good condition (unbroken)? YES  NO
7. Were all bottle labels complete (i.e. analysis, preservation, etc.)? YES  NO
8. Did all bottle labels and tags agree with custody papers? YES  NO
9. Were the correct types of bottles used for the tests indicated? YES  NO
10. Were all of the preserved bottles received at the lab with the appropriate pH? YES  NO
11. Were VOA vials checked for absence of air bubbles, and if present, noted below? YES  NO
12. Did the bottles originate from CAS/K or a branch laboratory? YES  NO

Explain any discrepancies \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Samples that required preservation or received outside of temperature range at the lab(circle)

Sample ID	Reagent	Volume	Lot Number	Initials

00082

HART CROWSER INC.

FEB 24 2000

Portland Office



February 23, 2000

Service Request No: K2000914

Howard Cumberland  
Hart Crowser, Inc.  
Five Centerpointe Drive, Suite 240  
Lake Oswego, OR 97035

**Re: POP-Terminal 5/5930**

Dear Howard:

Enclosed are the results of the sample(s) submitted to our laboratory on November 22, 1999. For your reference, these analyses have been assigned our service request number K2000914.

All analyses were performed according to our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 3343.

Respectfully submitted,

**Columbia Analytical Services, Inc.**



Richard Craven  
Project Chemist

RAC/aw

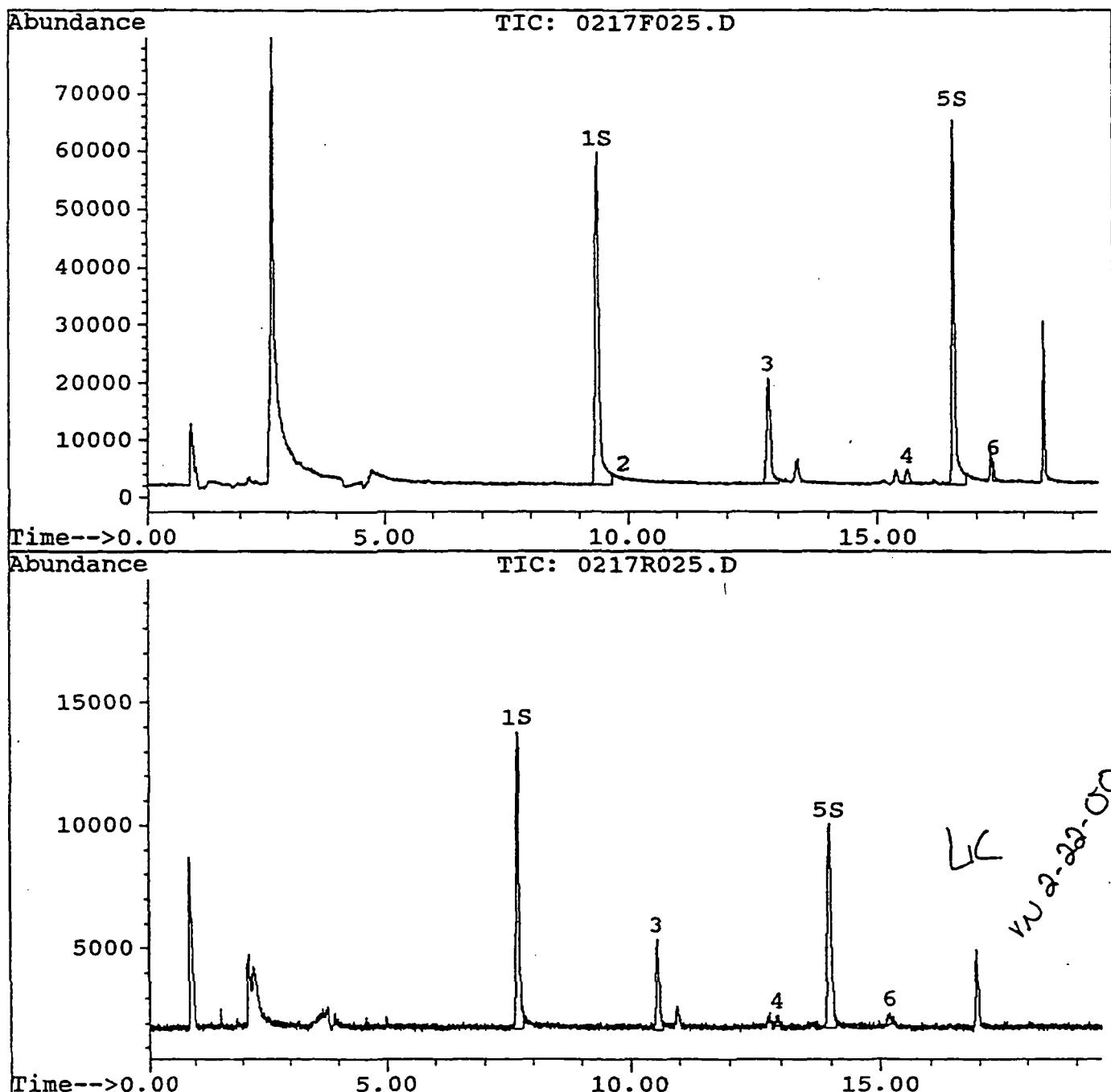
Page 1 of 91

Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F025.D Vial: 15  
 Signal #2 : J:\GC11\DATA\021700\0217F025.D\0217R025.D  
 Acq On : 18 Feb 00 01:52 AM Operator: lkennedy  
 Sample : K2000914-002 | HC-VC-BS01-02 Inst : GC11  
 Misc : SVG\PORE-TIN\00914002.H | F=.5 D=1 A=85 Multiplr: 1.00  
 Quant Time: Feb 18 9:40 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Signal #1 : J:\GC11\DATA\021700\0217F017.D  
Acq On : 17 Feb 00 10:41 PM  
Sample : K2001000-003 | HC-L03-LW  
Misc : SVG\TIN-SVG\01000003.H | F=.5 D=1 A=250 /

Vial: 10  
Operator: lkennedy  
Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or ml) = 250

Conversion Factor = (F x D) / = 0.002

Volume Inj. : 3  $\mu$ L

Signal #1 : RTX-50

Signal #2 : RTX-200

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2	
Tri-n-propyltin	9.38	7.72	327551	49554	429.8	333.7	85.95	66.73	%
Tri-n-pentyltin	18.54	14.00	272411	44112	427.1	359.6	85.42	71.92	%

Solution

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Original		
							Conc#1	Conc#2	Units
Tri-n-butyltin	9.90	0.00	856	0	1.2	0.0	0.002	0.000	ppb
Tri-n-butyltin	12.82	10.56	5814	690	6.6	4.1	0.013	0.008	ppb
Di-n-butyltin	15.62	12.97	7135	1649	6.7	7.7	0.013	0.015	ppb
i-Butyltin	17.37	15.20	9745	1780	6.7	5.8	0.013	0.012	ppb

Analytes as Sn

Sn Conversion Factors

Tri-n-butyltin	0.3419	0.001	0.000	ng/ml
Tri-n-butyltin	0.4092	0.005	0.003	ng/ml
Di-n-butyltin	0.5095	0.007	0.008	ng/ml
i-Butyltin	0.6751	0.009	0.008	ng/ml

RIG CONC (< 0) are considered ND - None Detected

217F017.D TINS.MTH

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F017.D Vial: 10  
 Signal #2 : J:\GC11\DATA\021700\0217F017.D\0217R017.D  
 Acq On : 17 Feb 00 10:41 PM Operator: lkennedy  
 Sample : K2001000-003 | HC-L03-LW Inst : GC11  
 Misc : SVG\TIN-SVG\01000003.H | F=.5 D=1 A=250 Multiplr: 1.00  
 Quant Time: Feb 18 9:36 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50	Signal #2 Phase: RTX-200
Signal #1 Info : 0.53mm id	Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>							
System Monitoring Compounds							
1)	S Tri-n-propyltin	9.38	7.72	327551	49554	429.759	333.671
				Recovery	=	85.95%	66.73%
2)	S Tri-n-pentyltin	16.54	14.00	272411	44112	427.080	359.584
				Recovery	=	85.42%	71.92%
Target Compounds							
3)	Tetra-n-butyltin	9.90f	0.00	856	0	1.225	N.D. #
4)	Tri-n-butyltin	12.82	10.56	5814	690	6.649	4.112 #
5)	Di-n-butyltin	15.62	12.97	7135	1649	6.691	7.664
6)	n-Butyltin	17.37	15.20f	9745	1780	6.651	5.779

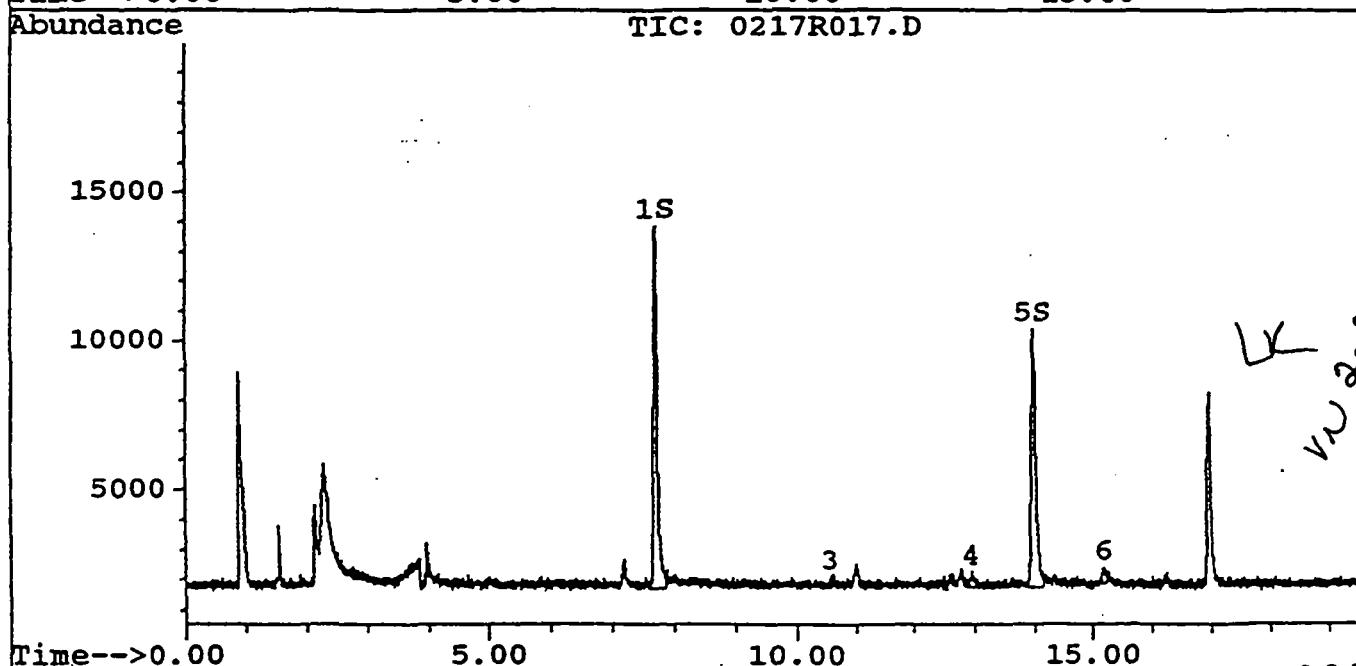
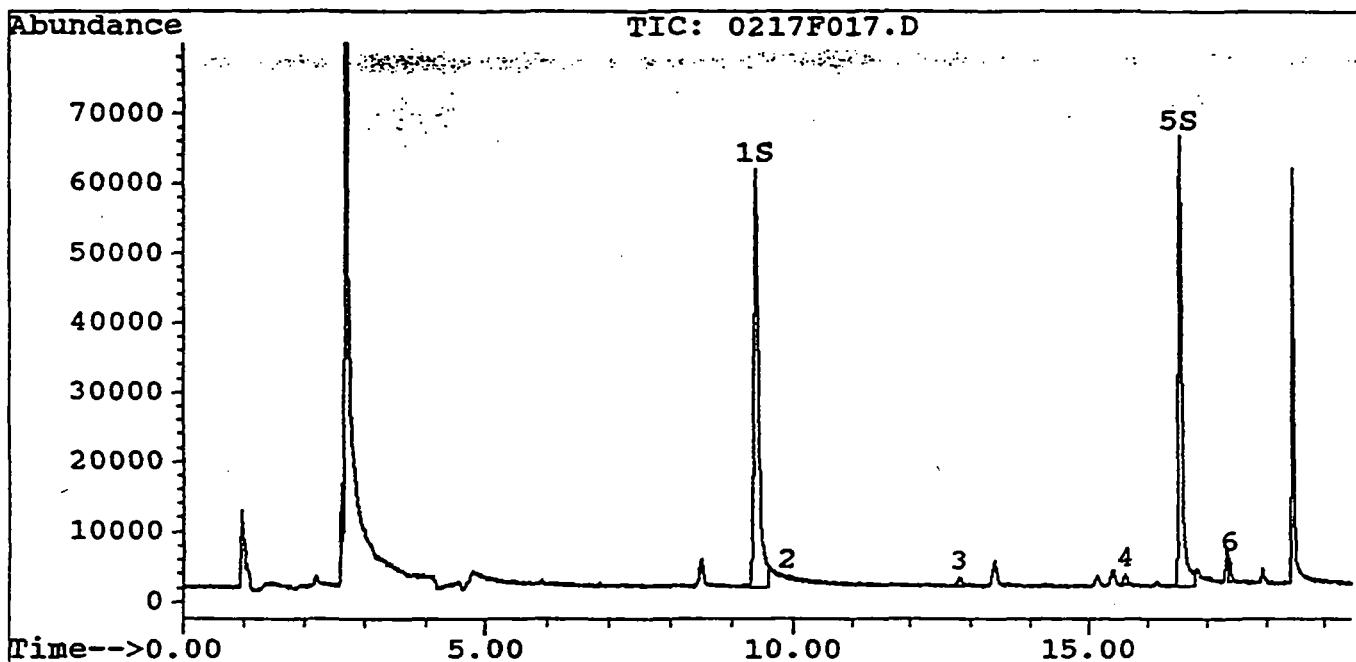
LIC  
2/18/00  
V.L. 2-22-00

### Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F017.D Vial: 10  
Signal #2 : J:\GC11\DATA\021700\0217F017.D\0217R017.D  
Acq On : 17 Feb 00 10:41 PM Operator: lkennedy  
Sample : K2001000-003 | HC-L03-LW Inst : GC11  
Misc : SVG\TIN-SVG\01000003.H | F=.5 D=1 A=250 Multiplr: 1.00  
Quant Time: Feb 18 9:36 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Signal #1 : J:\GC11\DATA\021700\0217F018.D  
Acq On : 17 Feb 00 11:05 PM  
Sample : KWG2000574-2 | K2001000-003MS | TIN-SVG,  
Misc : SVG\W2000574\2-MS.H | F=.5 D=1 A=250 ✓

Vial: 11  
Operator: lkennedy  
Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 250

$$\text{Conversion Factor} = (F \times D) / = 0.002$$

Volume Inj. : 3  $\mu$ L

Signal #1 : RTX-50

Signal #2 : RTX-200

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2
Tri-n-propyltin	9.39	7.72	304112	46501	389.0	313.1	(79.80)	62.62 %
Tri-n-pentyltin	16.54	14.00	243382	40598	381.6	330.9	(76.31)	68.19 %

$T_V = 1.0 \mu\text{g}/\text{L}$

Solution

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Original	Units
Estra-n-butyltin	10.02	8.31	254994	40762	364.9	337.7	(0.730)	ppb
tri-n-butyltin	12.83	10.59	384265	58600	439.5	349.2	(0.879)	ppb
Di-n-butyltin	15.62	12.97	375330	63579	352.0	295.5	(0.704)	ppb
-Butyltin	17.37	15.29	733267	121083	500.4	393.1	(1.001)	ppb

Analytes as Sn

Sn Conversion Factors

etra-n-butyltin	0.3419	0.250	0.231	ng/ml
tri-n-butyltin	0.4092	0.360	0.286	ng/ml
Di-n-butyltin	0.5095	0.359	0.301	ng/ml
-Butyltin	0.6751	0.676	0.531	ng/ml

LF  
2/18/00  
VN 2.22.00

NEG CONC (< 0) are considered ND - None Detected

17F018.D TINS.MTH

00029

butyltin

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F018.D Vial: 11  
 Signal #2 : J:\GC11\DATA\021700\0217F018.D\0217R018.D  
 Acq On : 17 Feb 00 11:05 PM Operator: lkennedy  
 Sample : KWG2000574-2 | K2001000-003MS | TIN-SVG Inst : GC11  
 Misc : SVG\W2000574\2-MS.H | F=.5 D=1 A=250 Multiplr: 1.00  
 Quant Time: Feb 18 9:36 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>						
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.39	7.72	304112	46501	399.006	313.113
			Recovery	=	79.80%	62.62%
S Tri-n-pentyltin	16.54	14.00	243382	40598	381.569	330.939
			Recovery	=	76.31%	66.19%
<hr/>						
<b>Target Compounds</b>						
Tetra-n-butyltin	10.02	8.31	254994	40762	364.922	337.687
Tri-n-butyltin	12.83	10.59	384265	58600	439.471	349.218
Di-n-butyltin	15.62	12.97	375330	63579	351.970	295.482
n-Butyltin	17.37	15.29	733267	121083	500.438	393.106

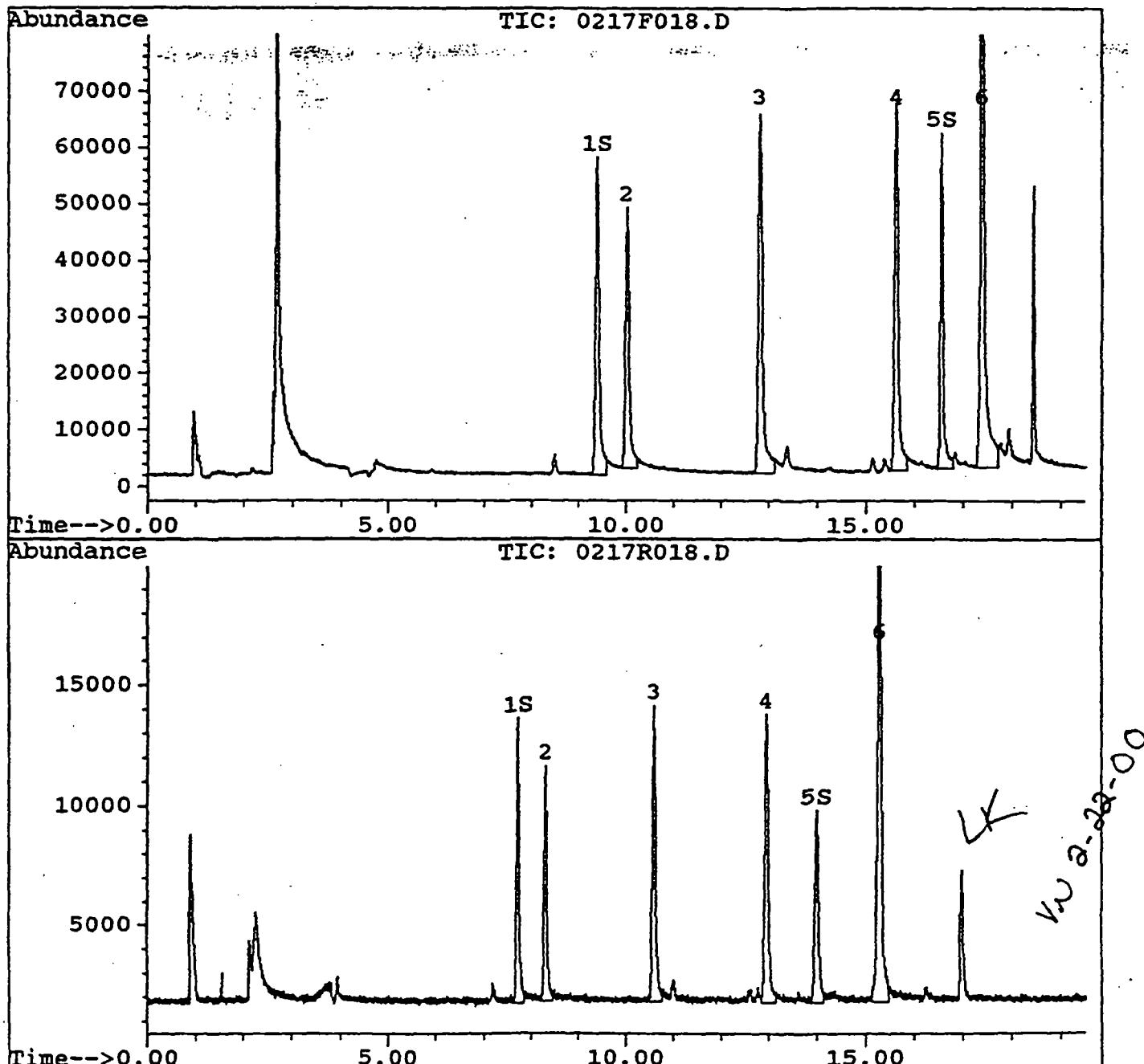
UK  
2/18/00  
2.22.00

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F018.D Vial: 11  
 Signal #2 : J:\GC11\DATA\021700\0217F018.D\0217R018.D  
 Acq On : 17 Feb 00 11:05 PM Operator: lkennedy  
 Sample : KWG2000574-2 | K2001000-003MS | TIN-SVG Inst : GC11  
 Misc : SVG\W2000574\2-MS.H | F=.5 D=1 A=250 Multiplr: 1.00  
 Quant Time: Feb 18 9:36 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.



Signal #1 : J:\GC11\DATA\021700\0217F019.D  
 Acq On : 17 Feb 00 11:29 PM  
 Sample : KWG2000574-3 | K2001000-003DMS | TIN-SVG  
 Misc : SVG\W2000574\3-DMS.H | F=.5 D=1 A=250 ✓

Vial: 12  
 Operator: lkennedy  
 Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
 Title : Butyltin by GC-FPD      D=Dilution Factor = 1  
 Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 250

$$\text{Conversion Factor} = (F \times D) / A = 0.002$$

Volume Inj. : 3 µL

Signal #1 : RTX-50  
 Signal #2 : RTX-200

Surrogates	Solution						Rec#1	Rec#2
	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2		
Tri-n-propyltin	9.38	7.71	321073	46903	421.3	315.8	64.25	63.16 %
Tri-n-pentyltin	16.53	13.98	260292	41258	408.1	336.3	81.82	87.26 %

$$TV = 1.0 \text{ mg/L}$$

Analytes	Solution						Original		
	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Conc#1	Conc#2	Units
Tetra-n-butyltin	10.01	8.29	258566	40773	370.0	337.8	0.740	0.676	ppb
Tri-n-butyltin	12.82	10.57	391310	58279	447.5	347.3	0.895	0.695	ppb
Di-n-butyltin	15.60	12.96	362389	57157	339.8	265.6	0.680	0.531	ppb
n-Butyltin	17.36	15.27	686071	107248	468.2	348.2	0.936	0.696	ppb

Analytes as Sn	Sn Conversion Factors			
	0.3419	0.253	0.231	ng/ml
Tetra-n-butyltin	0.4092	0.366	0.284	ng/ml
Di-n-butyltin	0.5095	0.346	0.271	ng/ml
1-Butyltin	0.6751	0.632	0.470	ng/ml

\*)RIG CONC (< 0) are considered ND - None Detected

217F019.D TINS.MTH

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F019.D Vial: 12  
 Signal #2 : J:\GC11\DATA\021700\0217F019.D\0217R019.D  
 Acq On : 17 Feb 00 11:29 PM Operator: lkennedy  
 Sample : KWG2000574-3 | K2001000-003DMS | TIN-SVG Inst : GC11  
 Misc : SVG\W2000574\3-DMS.H | F=.5 D=1 A=250 Multiplr: 1.00  
 Quant Time: Feb 18 9:37 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>						
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.38	7.71	321073	46903	421.259	315.820 #
			Recovery	=	84.25%	63.16%
S Tri-n-pentyltin	16.53	13.98	260292	41258	408.080	336.320
			Recovery	=	81.62%	67.26%
<hr/>						
<b>Target Compounds</b>						
Tetra-n-butyltin	10.01	8.29	258566	40773	370.034	337.778
Tri-n-butyltin	12.82	10.57	391310	58279	447.528	347.305
Di-n-butyltin	15.60	12.96	362389	57157	339.835	265.636
n-Butyltin	17.36	15.27	686071	107248	468.228	348.190 #

4  
2-18-00

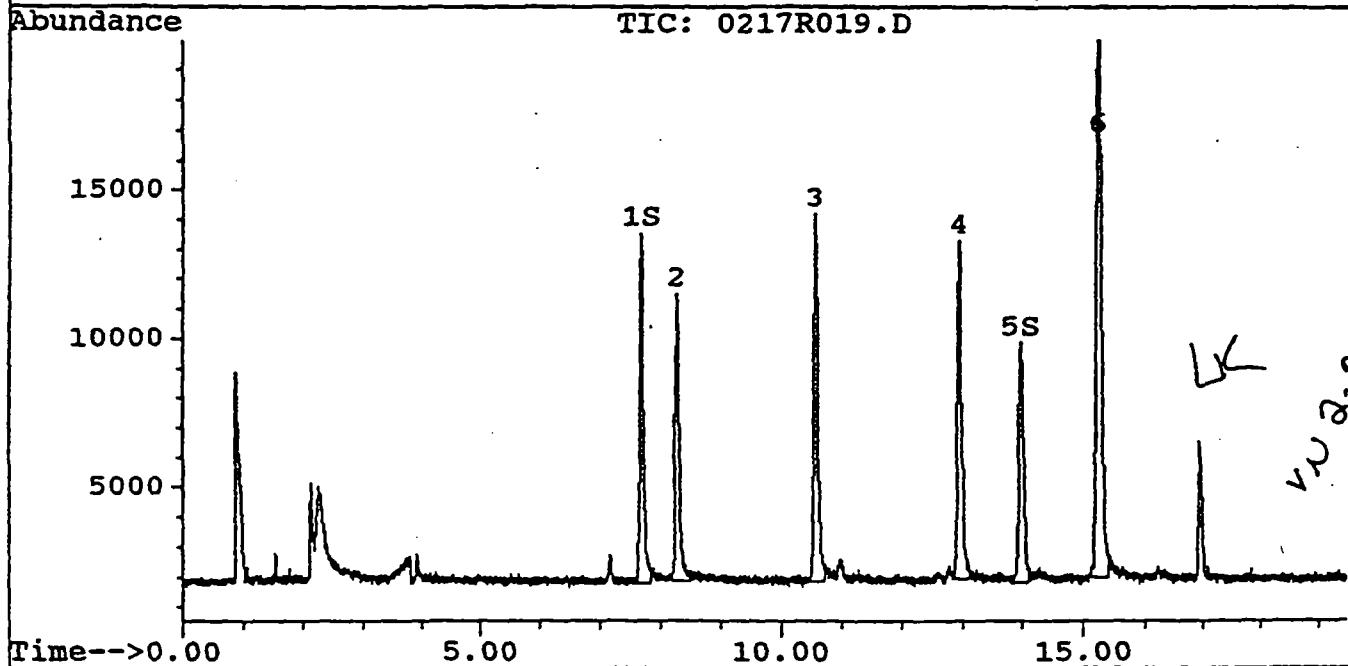
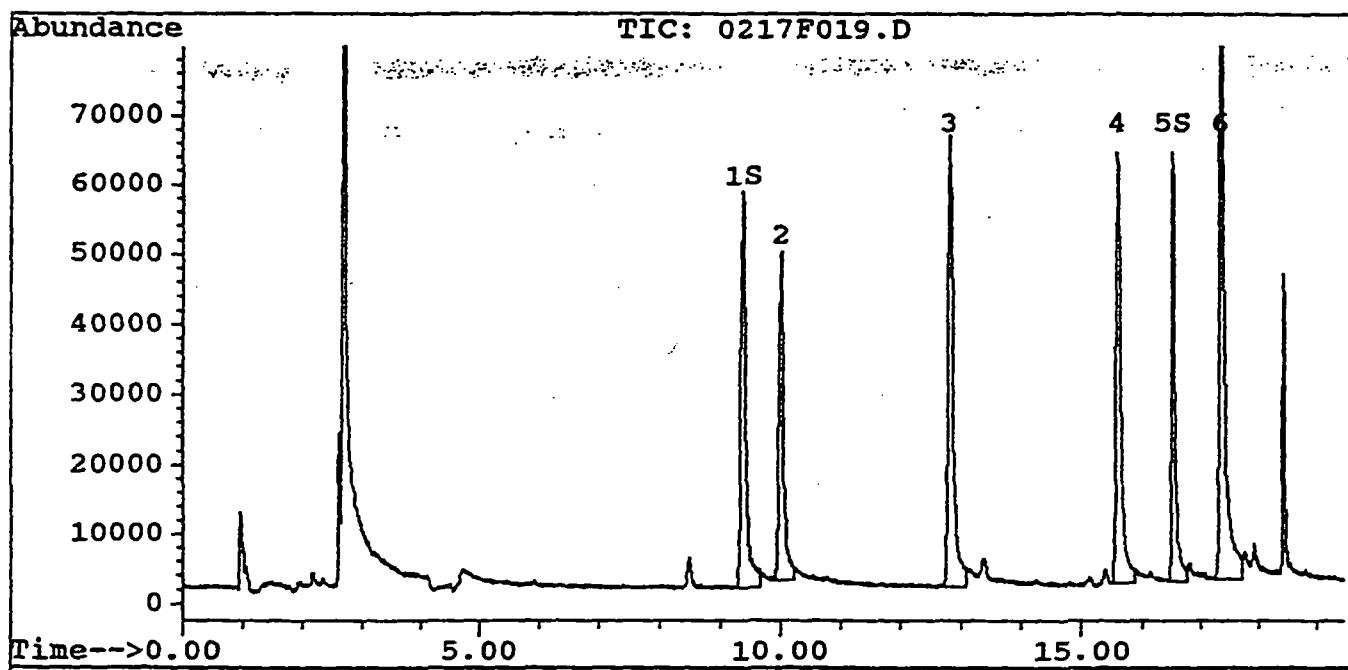
4  
2-22-00

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F019.D Vial: 12  
Signal #2 : J:\GC11\DATA\021700\0217F019.D\0217R019.D  
Acq On : 17 Feb 00 11:29 PM Operator: lkennedy  
Sample : KWG2000574-3 | K2001000-003DMS | TIN-SVG Inst : GC11  
Misc : SVG\W2000574\3-DMS.H | F=.5 D=1 A=250 Multiplr: 1.00  
Quant Time: Feb 18 9:37 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Signal #1 : J:\GC11\DATA\021700\0217F013.D  
Acq On : 17 Feb 00 09:06 PM  
Sample : KWG2000574-4 | LCS | H2O | TIN-SVG  
Misc : SVG\W2000574\4-LCS.H | F=.5 D=1 A=500✓

Vial: 6  
Operator: lkennedy  
Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 500

$$\text{Conversion Factor} = (F \times D) / = 0.001$$

Volume Inj. : 3  $\mu$ L

Signal #1 : RTX-50

Signal #2 : RTX-200

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2
Tri-n-propyltin	9.38	7.71	344908	51263	452.5	345.2	90.51	69.04
Tri-n-pentyltin	16.53	13.98	275545	46289	432.0	377.3	86.40	75.47

$$TV = 0.5 \text{ mg/L}$$

Solution

Analytes	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Conc#1	Conc#2	Units
Tetra-n-butyltin	10.01	8.30	278647	41991	398.8	347.9	0.399	0.348	ppb
Tri-n-butyltin	12.82	10.58	408438	63522	467.1	378.6	0.467	0.379	ppb
Di-n-butyltin	15.60	12.95	435306	68191	408.2	316.9	0.408	0.317	ppb
n-Butyltin	17.36	15.27	710301	115487	484.8	374.9	0.485	0.375	ppb

Sn Conversion Factors

Tetra-n-butyltin	0.3419	0.136	0.119	ng/ml
Tri-n-butyltin	0.4092	0.191	0.155	ng/ml
Di-n-butyltin	0.5095	0.208	0.161	ng/ml
n-Butyltin	0.6751	0.327	0.253	ng/ml

IRIG CONC (< 0) are considered ND - None Detected

217F013.D TINS.MTH

00035

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F013.D Vial: 6  
 Signal #2 : J:\GC11\DATA\021700\0217F013.D\0217R013.D  
 Acq On : 17 Feb 00 09:06 PM Operator: lkennedy  
 Sample : KWG2000574-4 | LCS | H2O | TIN-SVG Inst : GC11  
 Misc : SVG\W2000574\4-LCS.H | F=.5 D=1 A=500 Multiplr: 1.00  
 Quant Time: Feb 18 9:33 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50  
 Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200  
 Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>						
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.38	7.71	344908	51263	452.532	345.178
			Recovery	=	90.51%	69.04%
S Tri-n-pentyltin	16.53	13.98	275545	46289	431.993	377.330
			Recovery	=	86.40%	75.47%
<hr/>						
<b>Target Compounds</b>						
Tetra-n-butyltin	10.01	8.30	278647	41991	398.772	347.868
Tri-n-butyltin	12.82	10.58	408438	63522	467.117	378.550
Di-n-butyltin	15.60	12.95	435306	68191	408.214	316.916
n-Butyltin	17.36	15.27	710301	115487	484.765	374.939

VL  
2-18-00  
NL 2-22-00

)=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 17F013.D 0209TINS.M Fri Feb 18 09:46:04 2000

000361  
Page 1

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F013.D Vial: 6  
 Signal #2 : J:\GC11\DATA\021700\0217F013.D\0217R013.D  
 Acq On : 17 Feb 00 09:06 PM Operator: lkennedy  
 Sample : KWG2000574-4 | LCS | H<sub>2</sub>O | TIN-SVG Inst : GC11  
 Misc : SVG\W2000574\4-LCS.H | F=.5 D=1 A=500 Multiplr: 1.00  
 Quant Time: Feb 18 9:33 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

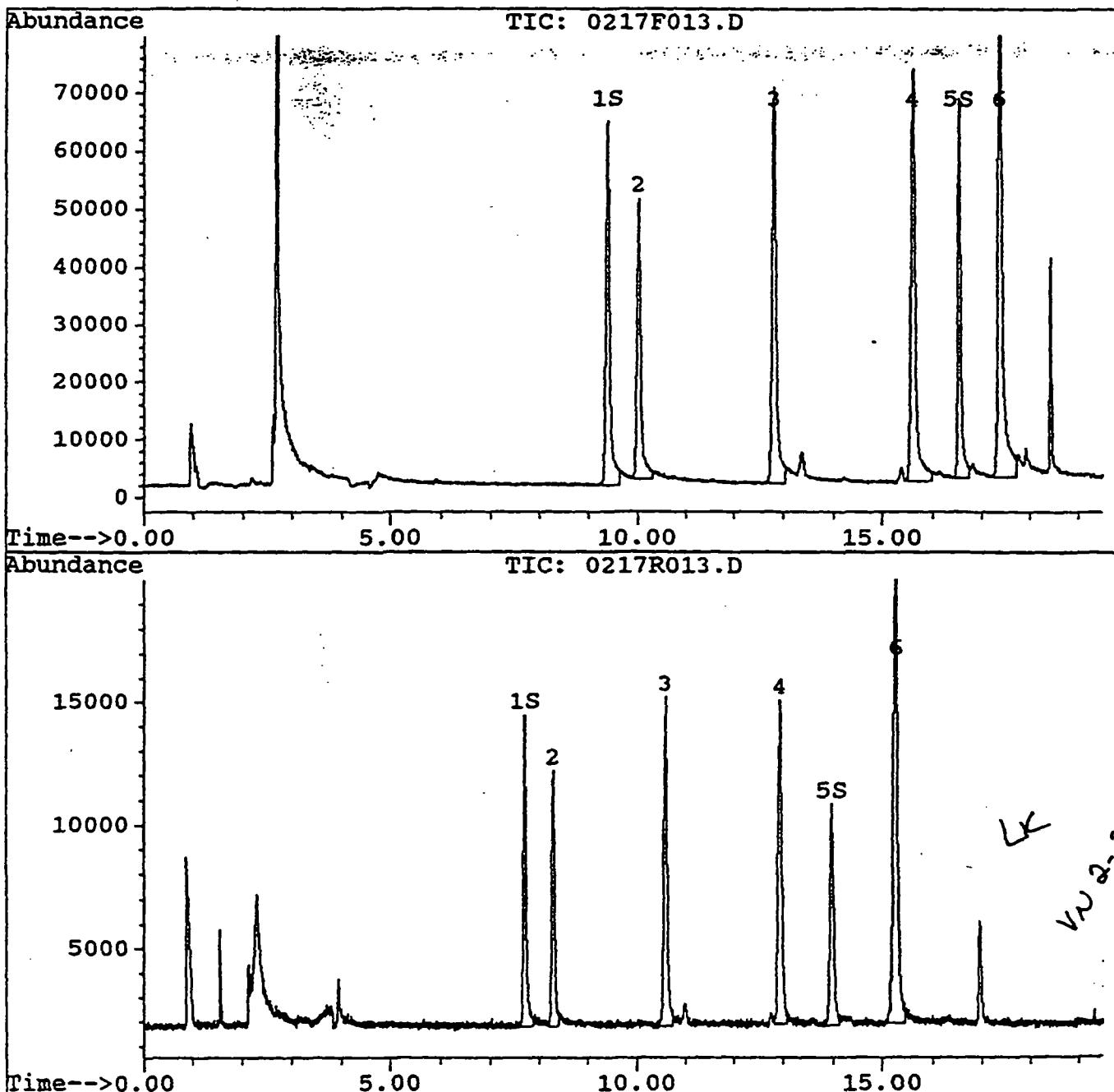
Volume Inj. :

Signal #1 Phase : RTX-50

Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200

Signal #2 Info : 0.53mm id.



Signal #1 : J:\GC11\DATA\021700\0217F012.D  
Acq On : 17 Feb 00 08:42 PM  
Sample : KWG2000574-1 | MB | SEDIMENT | PORE-TIN  
Misc : SVG\W2000574\1-MB.H | F=.5 D=1 A=500 ✓

Vial: 5  
Operator: Ikennedy  
Inst : GC11

Method : TINS.MTH      F=Final Volume (mls) = 0.5  
Title : Butyltins by GC-FPD      D=Dilution Factor = 1  
Last Update : Fri Feb 18 09:43:00 2000      A=Amount Extracted (g or m) = 500  
  
Conversion Factor = (F x D) / = 0.001

Volume Inj. : 3 µL

Signal #1 : RTX-50  
Signal #2 : RTX-200

Solution

Surrogates	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Rec#1	Rec#2	
Tri-n-propyltin	8.35	7.72	308769	48131	405.7	324.1	81.02	64.82	%
Tri-n-pentyltin	18.53	13.98	288067	47995	451.6	391.2	90.33	78.25	%

Solution

Original

Analyses	RT#1	RT#2	Resp#1	Resp#2	Conc#1	Conc#2	Conc#1	Conc#2	Units
Estra-n-butyltin	0.00	0.00	0	0	0.0	0.0	0.000	0.000	ppb
Tri-n-butyltin	0.00	0.00	0	0	0.0	0.0	0.000	0.000	ppb
Di-n-butyltin	15.59	0.00	642	0	0.6	0.0	0.001	0.000	ppb
-Butyltin	17.31	15.17	20070	1727	13.7	5.6	0.014	0.006	ppb

Analyses as Sn

Sn Conversion Factors

Estra-n-butyltin	0.3419	0.000	0.000	ng/ml
Tri-n-butyltin	0.4092	0.000	0.000	ng/ml
Di-n-butyltin	0.5095	0.000	0.000	ng/ml
-Butyltin	0.6751	0.009	0.004	ng/ml

RIG CONC (< 0) are considered ND - None Detected

217F012.D TINS.MTH

00038

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F012.D Vial: 5  
 Signal #2 : J:\GC11\DATA\021700\0217F012.D\0217R012.D  
 Acq On : 17 Feb 00 08:42 PM Operator: lkennedy  
 Sample : KWG2000574-1 | MB | SEDIMENT | PORE-TIN Inst : GC11  
 Misc : SVG\W2000574\1-MB.H | F=.5 D=1 A=500 Multiplr: 1.00  
 Quant Time: Feb 18 9:33 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.39	7.72	308769	48131	405.116	324.089
			Recovery	=	81.02%	64.82%
S Tri-n-pentyltin	16.53	13.98	288067	47995	451.625	391.237
			Recovery	=	90.33%	78.25%
<b>Target Compounds</b>						
Tetra-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
Tri-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
Di-n-butyltin	15.59	0.00	642	0	0.602	N.D. #
n-Butyltin	17.31f	15.17f	20070	1727	13.697	5.607 #

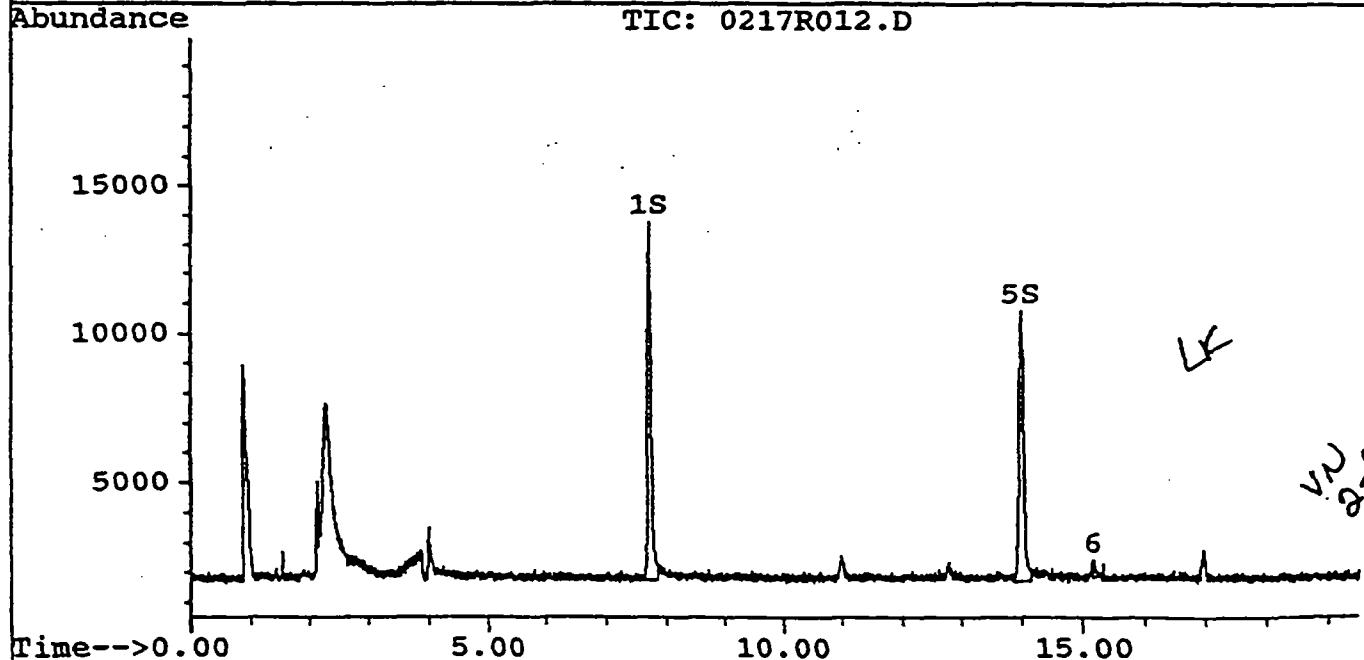
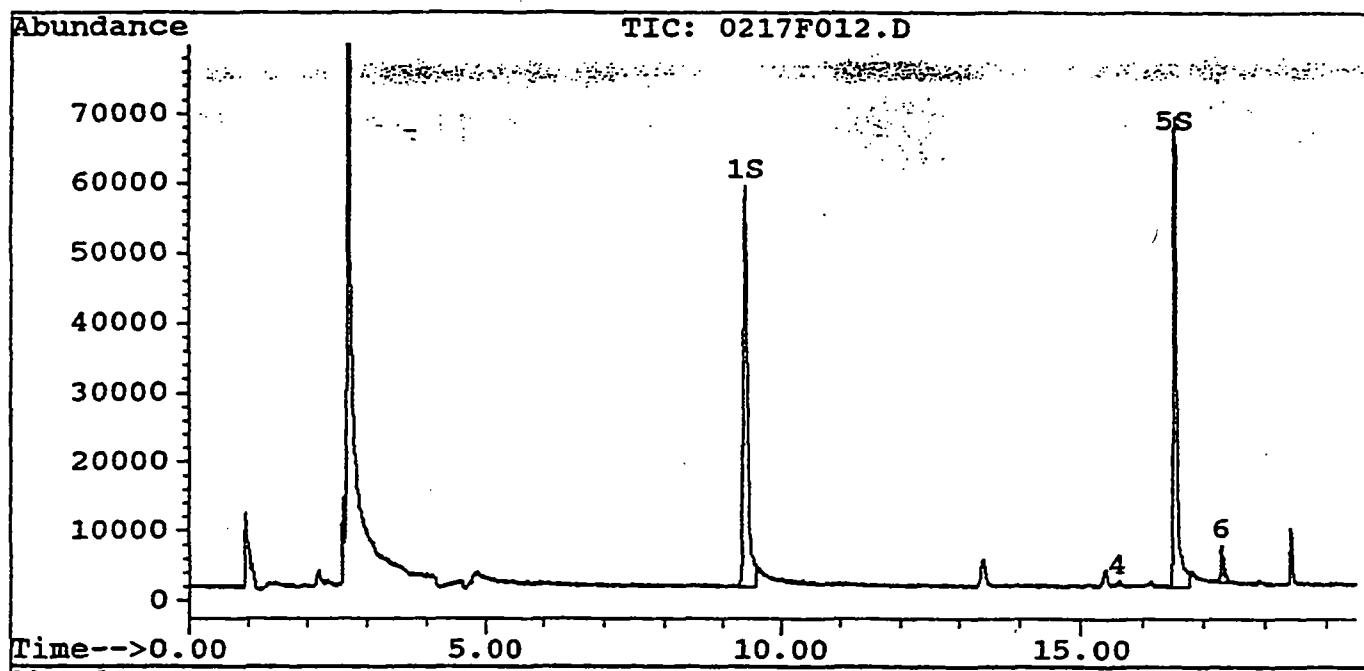
VN  
2-18-00  
VN 2-22-00

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F012.D Vial: 5  
 Signal #2 : J:\GC11\DATA\021700\0217F012.D\0217R012.D  
 Acq On : 17 Feb 00 08:42 PM Operator: lkennedy  
 Sample : KWG2000574-1 | MB | SEDIMENT | PORE-TIN Inst : GC11  
 Misc : SVG\W2000574\1-MB.H | F=.5 D=1 A=500 Multiplr: 1.00  
 Quant Time: Feb 18 9:33 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



# Analytical Runlog

Department: SVG  
Instrument Type: HP 5890 II

914  
844  
844  
844

Columbia Analytical Services

GC Serial #: 2950A28022

Sequence: 021700.S

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
									Comments
									Acceptability Criteria
									QC Solution IDs
K000217-IB-EH	0217F001.D		1	TINS.M	lkennedy		G11K000217		17 Feb 00 04:19 PM
									NA
K000217-IB-EH	0217F002.D		1	TINS.M	lkennedy		G11K000217		17 Feb 00 04:43 PM
									NA
K000217-IB-EH	0217F003.D		1	TINS.M	lkennedy		G11K000217		17 Feb 00 05:07 PM
									NA
K000217-IB-EH	0217F004.D		1	TINS.M	lkennedy		G11K000217		17 Feb 00 05:31 PM
									NA
K000217-IB-EH	0217F005.D		1	TINS.M	lkennedy		G11K000217		17 Feb 00 05:55 PM
									NA
K000217-IB-EI	0217F006.D		2	TINS.M	lkennedy		G11K000217		17 Feb 00 06:19 PM
									NA
K000217-IB-EI	0217F007.D		2	TINS.M	lkennedy		G11K000217		17 Feb 00 06:43 PM
									NA
K000217-IB-EI	0217F008.D		2	TINS.M	lkennedy		G11K000217		17 Feb 00 07:06 PM
									NA
K000217-IB-EI	0217F009.D		2	TINS.M	lkennedy		G11K000217		17 Feb 00 07:30 PM
									NA
K000217-CCV-6K	0217F010.D		3	TINS.M	lkennedy		G11K000217		17 Feb 00 07:54 PM
									OT2-73-B
KWC2000574-5	0217F011.D	Method Blank	4	TINS.M	lkennedy		G11K000217		17 Feb 00 08:18 PM
KWC2000574-1	0217F012.D	Method Blank	5	TINS.M	lkennedy		G11K000217		17 Feb 00 08:42 PM
KWC2000574-4	0217F013.D	Lab Control Sample	6	TINS.M	lkennedy		G11K000217		17 Feb 00 09:06 PM
K2000723-023	0217F014.D	IR17WB070A	7	TINS.M	lkennedy		G11K000217		17 Feb 00 09:30 PM

Overall Sequence Comments:

CL  
CL

CLV's

Primary Review:

LC

Date: 2-18-00

Secondary Review:

VA

Date: 2-22-00

Page Number: 1

# Analytical Runlog

Columbia Analytical Services

GC Serial #: 2950A28022

Sequence: 021700.S

Department: SVG

Instrument Type: HP 5890 II

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
									Comments
									Acceptability Criteria
									QC Solution IDs
K2001000-001	0217F015.D	HC-L02-C07	8	TINS.M	lkennedy		GIIK000217		17 Feb 00 09:54 PM
K2001000-002	0217F016.D	HC-L03-PB	9	TINS.M	lkennedy		GIIK000217		17 Feb 00 10:17 PM
K2001000-003	0217F017.D	HC-L03-LW	10	TINS.M	lkennedy		GIIK000217		17 Feb 00 10:41 PM
KWG2000574-2	0217F018.D	Matrix Spike	11	TINS.M	lkennedy		GIIK000217		17 Feb 00 11:05 PM
KWG2000574-3	0217F019.D	Duplicate Matrix Spike	12	TINS.M	lkennedy		GIIK000217		17 Feb 00 11:29 PM
K2001000-004	0217F020.D	HC-L03-C01	13	TINS.M	lkennedy		GIIK000217		17 Feb 00 11:53 PM
K000217-IB-EI	0217F021.D		2	TINS.M	lkennedy		GIIK000217		18 Feb 00 00:16 AM
K000217-IB-EI	0217F022.D		2	TINS.M	lkennedy		GIIK000217		18 Feb 00 00:40 AM
K000217-CCV-6K	0217F023.D		3	TINS.M	lkennedy		GIIK000217		18 Feb 00 01:04 AM
K2000914-001	0217F024.D	HC-VC-BS01-01	14	TINS.M	lkennedy		GIIK000217		18 Feb 00 01:28 AM
K2000914-002	0217F025.D	HC-VC-BS01-02	15	TINS.M	lkennedy		GIIK000217		18 Feb 00 01:52 AM
KWG2000568-4	0217F026.D	Method Blank	16	TINS.M	lkennedy		GIIK000217		18 Feb 00 02:15 AM
KWG2000568-3	0217F027.D	Lab Control Sample	17	TINS.M	lkennedy		GIIK000217		18 Feb 00 02:39 AM
K2000844-002	0217F028.D	S+G-S-LB8(35-36.5)	18	TINS.M	lkennedy		GIIK000217		18 Feb 00 03:03 AM

Overall Sequence Comments:

Primary Review:

LK

Date: 2-18-00

Secondary Review:

VN

Date: 2-22-00

Page Number:

2

# Analytical Runlog

Department: **SVG**  
Instrument Type: **HP 5890 II**

GC Serial #: 2950A28022

Sequence: 021700.S

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
									Comments
Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
									Acceptability Criteria
K2000844-004	0217F029.D	S+G-S-LB6(0-1)	19	TINS.M	lkennedy		G11K000217		18 Feb 00 03:27 AM
K2000844-007	0217F030.D	S+G-S-LB6(9-10.5)	20	TINS.M	lkennedy		G11K000217		18 Feb 00 03:51 AM
K2000844-009	0217F031.D	S+G-S-LB6(19-20)	21	TINS.M	lkennedy		G11K000217		18 Feb 00 04:14 AM
K2000844-012	0217F032.D	S+G-S-LB6(29-30.5)	22	TINS.M	lkennedy		G11K000217		18 Feb 00 04:38 AM
K2000844-014	0217F033.D	S+G-S-LB6(37.5-39)	23	TINS.M	lkennedy		G11K000217		18 Feb 00 05:02 AM
K000217-IB-E1	0217F034.D		2	TINS.M	lkennedy		G11K000217		18 Feb 00 05:26 AM
K000217-IB-E1	0217F035.D		2	TINS.M	lkennedy		G11K000217		18 Feb 00 05:49 AM
K000217-CCV-6K	0217F036.D		3	TINS.M	lkennedy		G11K000217		18 Feb 00 06:13 AM
K2000844-018	0217F037.D	S+G-S-LB6(75-76.5)	24	TINS.M	lkennedy		G11K000217		18 Feb 00 06:37 AM
K2000866-001	0217F038.D	S+G-S-LB6-(102.5-104)	25	TINS.M	lkennedy		G11K000217		18 Feb 00 07:01 AM
K2000866-003	0217F039.D	S+G-S-LB1-(0.5-1.5)	26	TINS.M	lkennedy		G11K000217		18 Feb 00 07:25 AM
K2000866-004	0217F040.D	S+G-S-LB1-(3-4)	27	TINS.M	lkennedy		G11K000217		18 Feb 00 07:48 AM
K2000866-006	0217F041.D	S+G-S-LB1-(7.5-9)	28	TINS.M	lkennedy		G11K000217		18 Feb 00 08:12 AM
K2000866-011	0217F042.D	S+G-S-LB1-(27.5-29)	29	TINS.M	lkennedy		G11K000217		18 Feb 00 08:36 AM

Overall Sequence Comments:

0

Primary Review: LK

Date: 2-18-00

Secondary Review: VW

Date: 2-22-00

Page Number: 3

Department: SVG  
Instrument Type: HP 5890 II

**Analytical Runlog**  
Columbia Analytical Services

Sequence: 021700.S

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
Comments			Acceptability Criteria			QC Solution IDs			
KWG2000568-1	0217F043.D	Matrix Spike	30	TINS.M	lkennedy		G11K000217		18 Feb 00 09:00 AM
KWG2000568-2	0217F044.D	Duplicate Matrix Spike	31	TINS.M	lkennedy		G11K000217		18 Feb 00 09:23 AM
K2000866-014	0217F045.D	S+G-S-LBI-(37.5-39)	32	TINS.M	lkennedy		G11K000217		18 Feb 00 09:47 AM
K000217-IB-EI	0217F046.D		2	TINS.M	lkennedy		G11K000217		18 Feb 00 10:11 AM
K000217-IB-EI	0217F047.D		2	TINS.M	lkennedy		G11K000217		18 Feb 00 10:35 AM
K000217-CCV-6K	0217F048.D		3	TINS.M	lkennedy		G11K000217		18 Feb 00 10:59 AM
NA	JUNKF009	NA	3	TINS.M	lkennedy	NA	NA	OT2-73-B	18 Feb 00 11:20 AM
						NA	NA	NA	

Overall Sequence Comments:

000

Primary Review:

LK

Date: 2-18-00

Secondary Review:

VN

Date: 2-22-00

Page Number:

4

Sequence Name: J:\GC11\SEQUENCE\021700.S

Comment:

Operator: lkennedy

Data Path: J:\GC11\DATA\021700\

Pre-Seq Cmd:

Post-Seq Cmd:

Method Sections To Run

On A Barcode Mismatch

(X) Full Method

(X) Inject Anyway

( ) Reprocessing Only

( ) Don't Inject

Line Type	Vial DataFile Method	Sample Name
1 DeleteGC		
2 MaskName - -----R---		
3 IB	1 0217F001 TINS	DCM
4 IB	1 0217F002 TINS	DCM
5 IB	1 0217F003 TINS	DCM
6 IB	1 0217F004 TINS	DCM
7 IB	1 0217F005 TINS	DCM
8 IB	2 0217F006 TINS	K000217-IB-EI
9 IB	2 0217F007 TINS	K000217-IB-EI
10 IB	2 0217F008 TINS	K000217-IB-EI
11 IB	2 0217F009 TINS	K000217-IB-EI
12 CCV	3 0217F010 TINS	OT @ 500ug/L   OT2-73-B
13 MB	4 0217F011 TINS	MB   H2O   TIN-SVG
14 MB	5 0217F012 TINS	MB   SEDIMENT   PORE-T
15 LCS	6 0217F013 TINS	KWG2000574-4   LCS   H2O   TIN-SVG
16 REX	7 0217F014 TINS	K2000723-023REX   IR17WB070A
17 SMPL	8 0217F015 TINS	HC-L02-C07
18 SMPL	9 0217F016 TINS	HC-L03-PB
19 SMPL	10 0217F017 TINS	HC-L03-LW
20 MS	11 0217F018 TINS	KWG2000574-2   K2001000-003MS
21 DMS	12 0217F019 TINS	KWG2000574-3   K2001000-003DMS
22 SMPL	13 0217F020 TINS	K2001000-004   HC-L03-C01
23 IB	2 0217F021 TINS	K000217-IB-EI
24 IB	2 0217F022 TINS	K000217-IB-EI
25 CCV	3 0217F023 TINS	OT @ 500ug/L   OT2-73-B
26 SMPL	14 0217F024 TINS	K2000914-001   HC-VC-BS01-01
27 SMPL	15 0217F025 TINS	K2000914-002   HC-VC-BS01-02
28 MB	16 0217F026 TINS	KWG2000568-4   MB   SOIL   TIN-SVG
29 LCS	17 0217F027 TINS	KWG2000568-3   LCS   SOIL   TIN-SVG
30 SMPL	18 0217F028 TINS	K2000844-002   S+G-S-LB8(35-36.5)
31 SMPL	19 0217F029 TINS	K2000844-004   S+G-S-LB6(0-1)
32 SMPL	20 0217F030 TINS	K2000844-007   S+G-S-LB6(9-10.5)
33 SMPL	21 0217F031 TINS	K2000844-009   S+G-S-LB6(19-20)
34 SMPL	22 0217F032 TINS	K2000844-012   S+G-S-LB6(29-30.5)
35 SMPL	23 0217F033 TINS	K2000844-014   S+G-S-LB6(37.5-39)
36 IB	2 0217F034 TINS	K000217-IB-EI
37 IB	2 0217F035 TINS	K000217-IB-EI
38 CCV	3 0217F036 TINS	OT @ 500ug/L   OT2-73-B
39 SMPL	24 0217F037 TINS	K2000844-018   S+G-S-LB6(75-76.5)
40 SMPL	25 0217F038 TINS	K2000866-001   S+G-S-LB6-(102.5-104)
41 SMPL	26 0217F039 TINS	K2000866-003   S+G-S-LB1-(0.5-1.5)
42 SMPL	27 0217F040 TINS	K2000866-004   S+G-S-LB1-(3-4)
43 SMPL	28 0217F041 TINS	K2000866-006   S+G-S-LB1-(7.5-9)

Sequence Name: J:\GC11\SEQUENCE\021700.S

Line	Type	Vial	DataFile	Method	Sample Name
44	SMPL	29	0217F042	TINS	K2000866-011   S+G-S-LB1-(27.5-29)
45	MS	30	0217F043	TINS	KWG2000568-1   K2000866-011MS   TIN-S
46	DMS	31	0217F044	TINS	KWG2000568-2   K2000866-011DMS   TIN-
47	SMPL	32	0217F045	TINS	K2000866-014   S+G-S-LB1-(37.5-39)
48	IB	2	0217F046	TINS	K000217-IB-EI
49	IB	2	0217F047	TINS	K000217-IB-EI
50	CCV	3	0217F048	TINS	OT @ 500ug/L   OT2-73-B

**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F009.D Vial: 2  
 Signal #2 : J:\GC11\DATA\021700\0217F009.D\0217R009.D  
 Acq On : 17 Feb 00 07:30 PM Operator: lkennedy  
 Sample : K000217-IB-EI Inst : GC11  
 Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
 Quant Time: Feb 18 9:31 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>							
S	Tri-n-propyltin	0.00	0.00	0	0	N.D.	N.D.
				Recovery	=	0.00%	0.00%
S	Tri-n-pentyltin	0.00	0.00	0	0	N.D.	N.D.
				Recovery	=	0.00%	0.00%
<b>Target Compounds</b>							
	Tetra-n-butyltin	10.07f	0.00	512	0	0.733	N.D. #
	Tri-n-butyltin	0.00	10.62f	0	517	N.D.	3.081 #
	Di-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
	n-Butyltin	17.37	0.00	873	0	0.596	N.D. #

LK  
2-18-00  
2-18-00

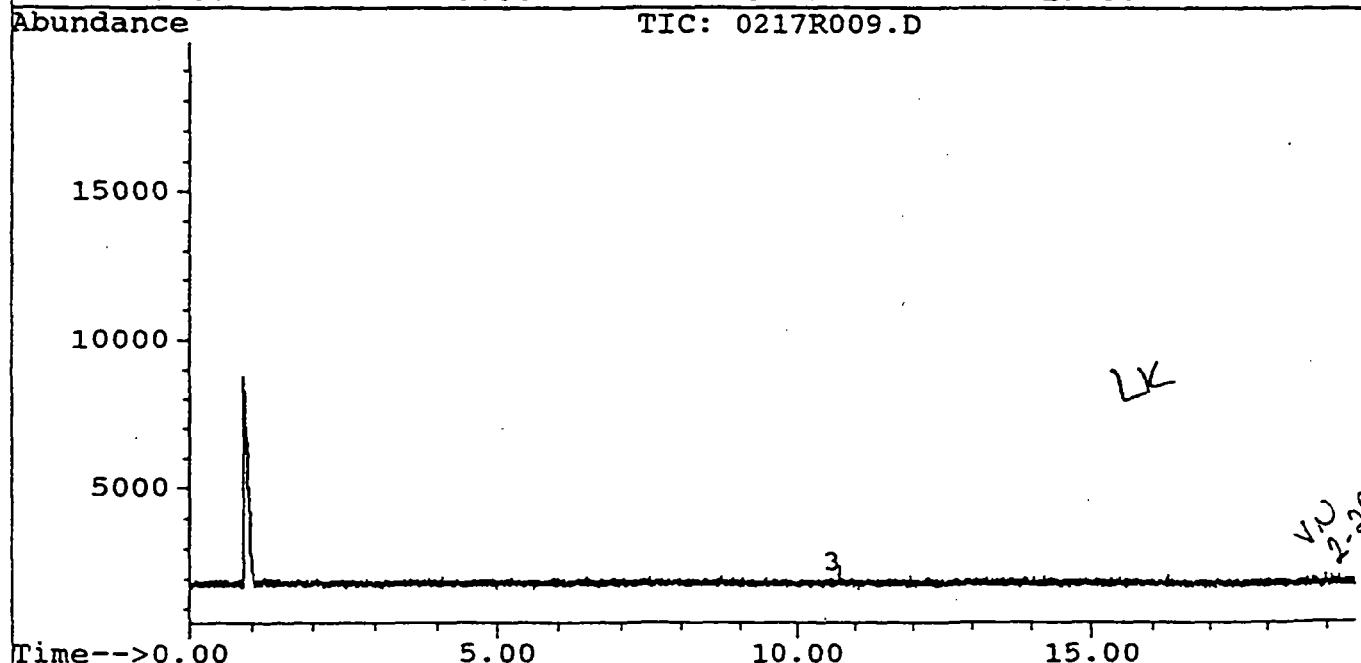
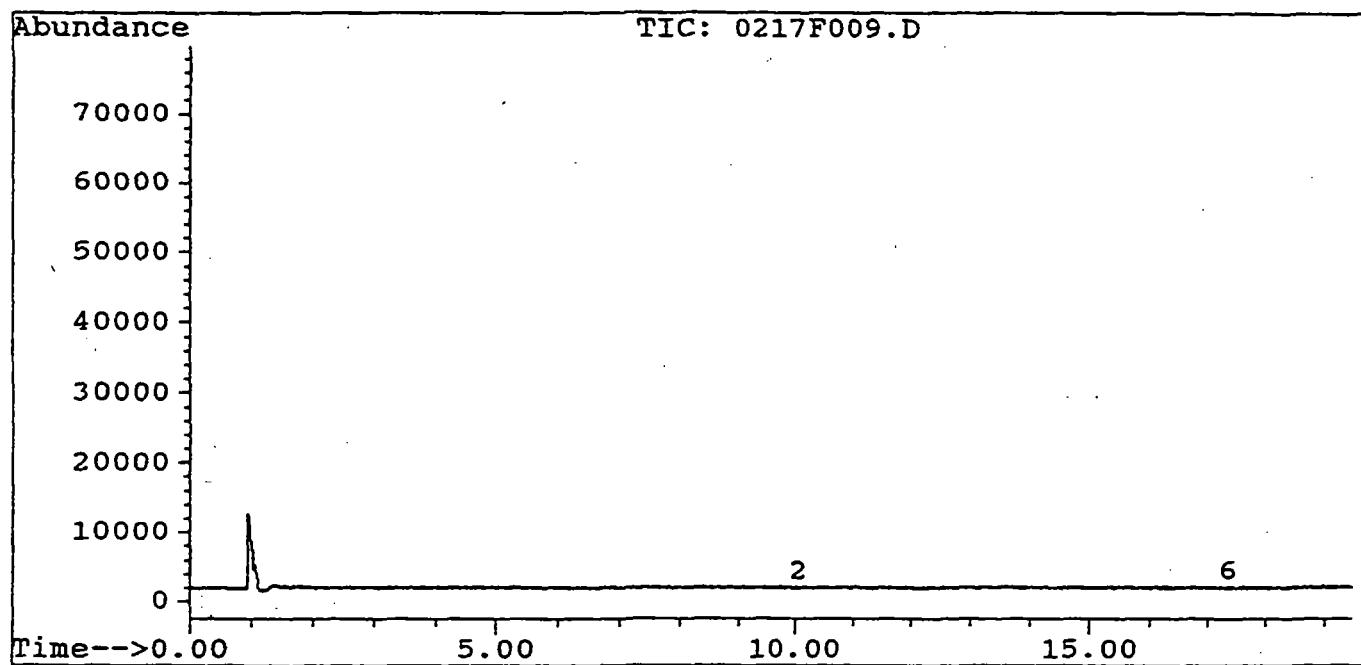
)=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 17F009.D 0209TINS.M Fri Feb 18 09:43:54 2000

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F009.D Vial: 2  
Signal #2 : J:\GC11\DATA\021700\0217F009.D\0217R009.D  
Acq On : 17 Feb 00 07:30 PM Operator: lkennedy  
Sample : K000217-IB-EI Inst : GC11  
Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
Quant Time: Feb 18 9:31 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F010.D Vial: 3  
 Signal #2 : J:\GC11\DATA\021700\0217F010.D\0217R010.D  
 Acq On : 17 Feb 00 07:54 PM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100217\CCV-6K.H | Multiplr: 1.00  
 Quant Time: Feb 18 9:32 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50	Signal #2 Phase: RTX-200
Signal #1 Info : 0.53mm id	Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
----------	------	------	--------	--------	-------	-------

**System Monitoring Compounds**

S	Tri-n-propyltin	9.37	7.71	403810	72705	529.813	489.557
S	Recovery				=	105.96%	97.91%
S	Tri-n-pentyltin	16.52	13.97	329505	58219	516.591	474.579
S	Recovery				=	103.32%	94.92%

**Target Compounds**

Tetra-n-butyltin	10.00	8.29	353567	63617	505.990	527.026 <sup>490</sup>
Tri-n-butyltin	12.80	10.56	444966	81618	508.893	486.391 <sup>475</sup>
Di-n-butyltin	15.59	12.93	568383	102190	533.008	474.925 <sup>510</sup>
n-Butyltin	17.36	15.26	752142	138387	513.320	449.285 <sup>490</sup>

LL  
J-18-00

1/2-22-00

=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 7F010.D 0209TINS.M Fri Feb 18 09:44:25 2000

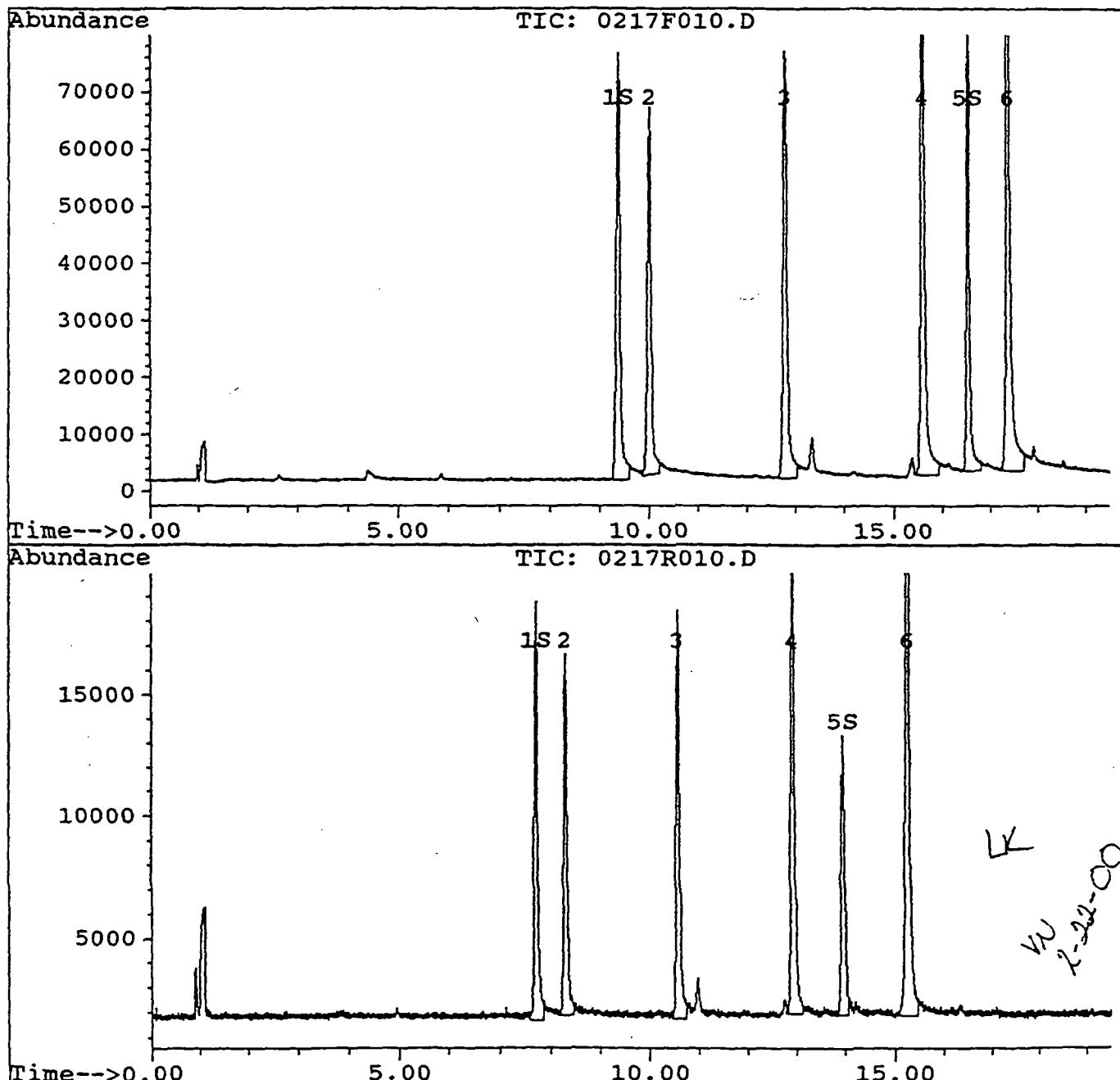
Page 49

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F010.D Vial: 3  
Signal #2 : J:\GC11\DATA\021700\0217F010.D\0217R010.D  
Acq On : 17 Feb 00 07:54 PM Operator: lkennedy  
Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
Misc : SVG\qc\K100217\CCV-6K.H | Multiplr: 1.00  
Quant Time: Feb 18 9:32 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F022.D Vial: 2  
 Signal #2 : J:\GC11\DATA\021700\0217F022.D\0217R022.D  
 Acq On : 18 Feb 00 00:40 AM Operator: lkennedy  
 Sample : K000217-IB-EI Inst : GC11  
 Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
 Quant Time: Feb 18 9:38 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>							
S	System Monitoring Compounds						
S	Tri-n-propyltin	0.00	0.00	0	0	N.D.	N.D.
S	Tri-n-pentyltin	0.00	0.00	Recovery	=	0.00%	0.00%
				0	0	N.D.	N.D.
				Recovery	=	0.00%	0.00%
<hr/>							
Target Compounds							
	Tetra-n-butyltin	9.97	0.00	511	0	0.731	N.D. #
	Tri-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
	Di-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
	n-Butyltin	0.00	0.00	0	0	N.D.	N.D.

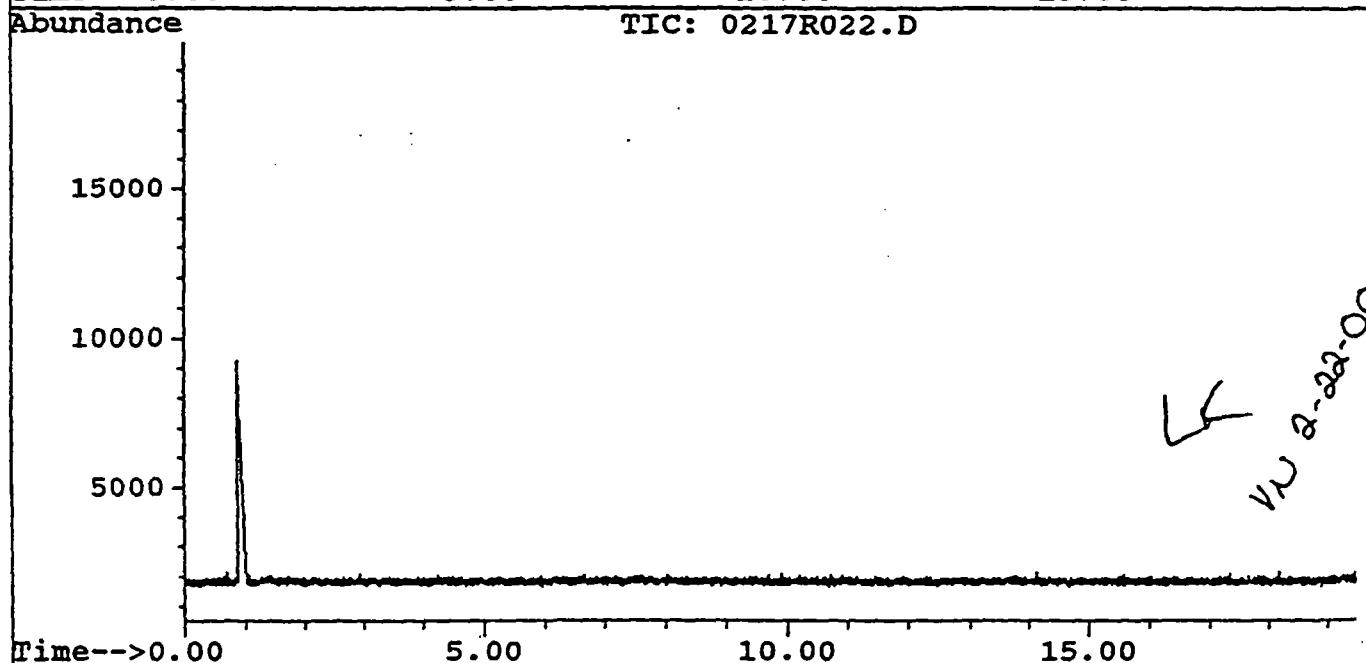
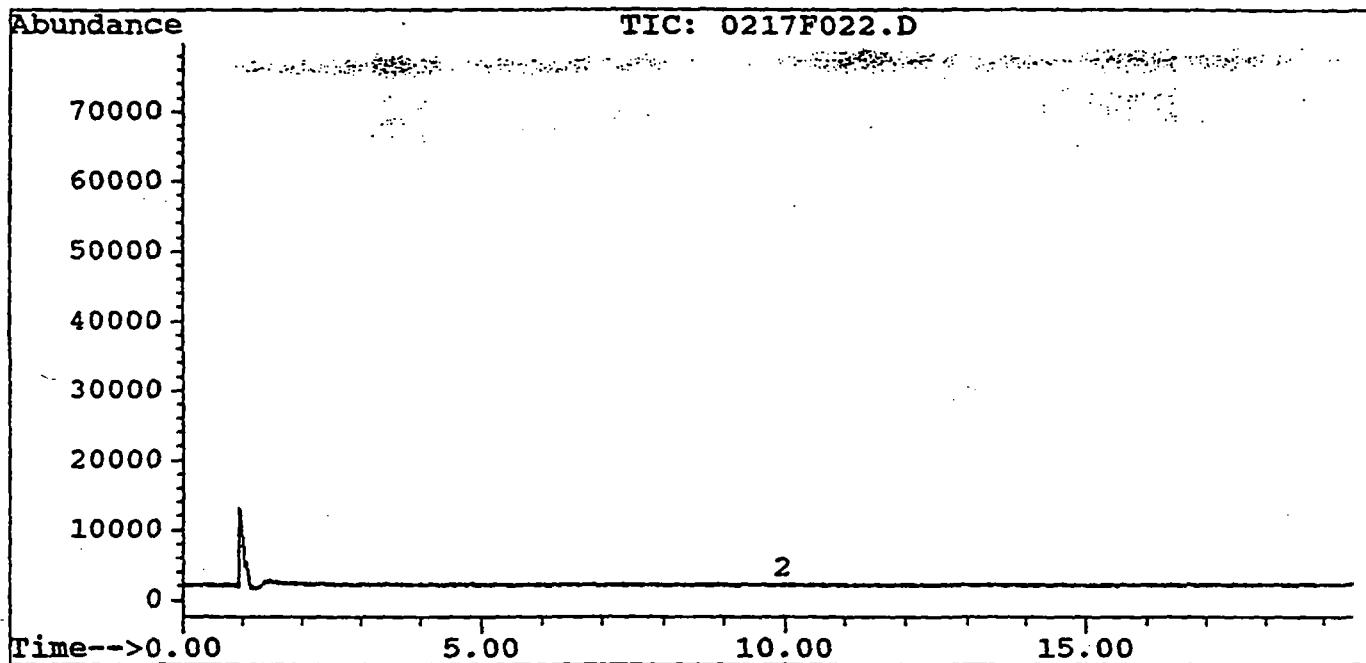
✓  
2-18-00  
RU 2-22-00

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F022.D Vial: 2  
Signal #2 : J:\GC11\DATA\021700\0217F022.D\0217R022.D  
Acq On : 18 Feb 00 00:40 AM Operator: lkennedy  
Sample : K000217-IB-EI Inst : GC11  
Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
Quant Time: Feb 18 9:38 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F023.D Vial: 3  
 Signal #2 : J:\GC11\DATA\021700\0217F023.D\0217R023.D  
 Acq On : 18 Feb 00 01:04 AM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100217\CCV-6K.H | Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

	Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>							
S	System Monitoring Compounds						
S	Tri-n-propyltin	9.37	7.70	386035	66511	506.492	447.850
S				Recovery	=	101.30%	89.57%
S	Tri-n-pentyltin	16.52	13.98	318012	57988	498.572	472.696
S				Recovery	=	99.71%	94.54%
<hr/>							
Target Compounds							
	Tetra-n-butyltin	9.99	8.28	325452	61573	465.755	510.092 <sup>490</sup>
	Tri-n-butyltin	12.81	10.57	439323	81379	502.439	484.967 <sup>475</sup>
	Di-n-butyltin	15.60	12.94	552364	101856	517.986	473.373 <sup>510</sup>
	n-Butyltin	17.36	15.26	734137	135207	501.032	438.961 <sup>490</sup>

LK  
2-18-00  
VV 2-22-00

)=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 17F023.D 0209TINS.M Fri Feb 18 09:51:34 2000

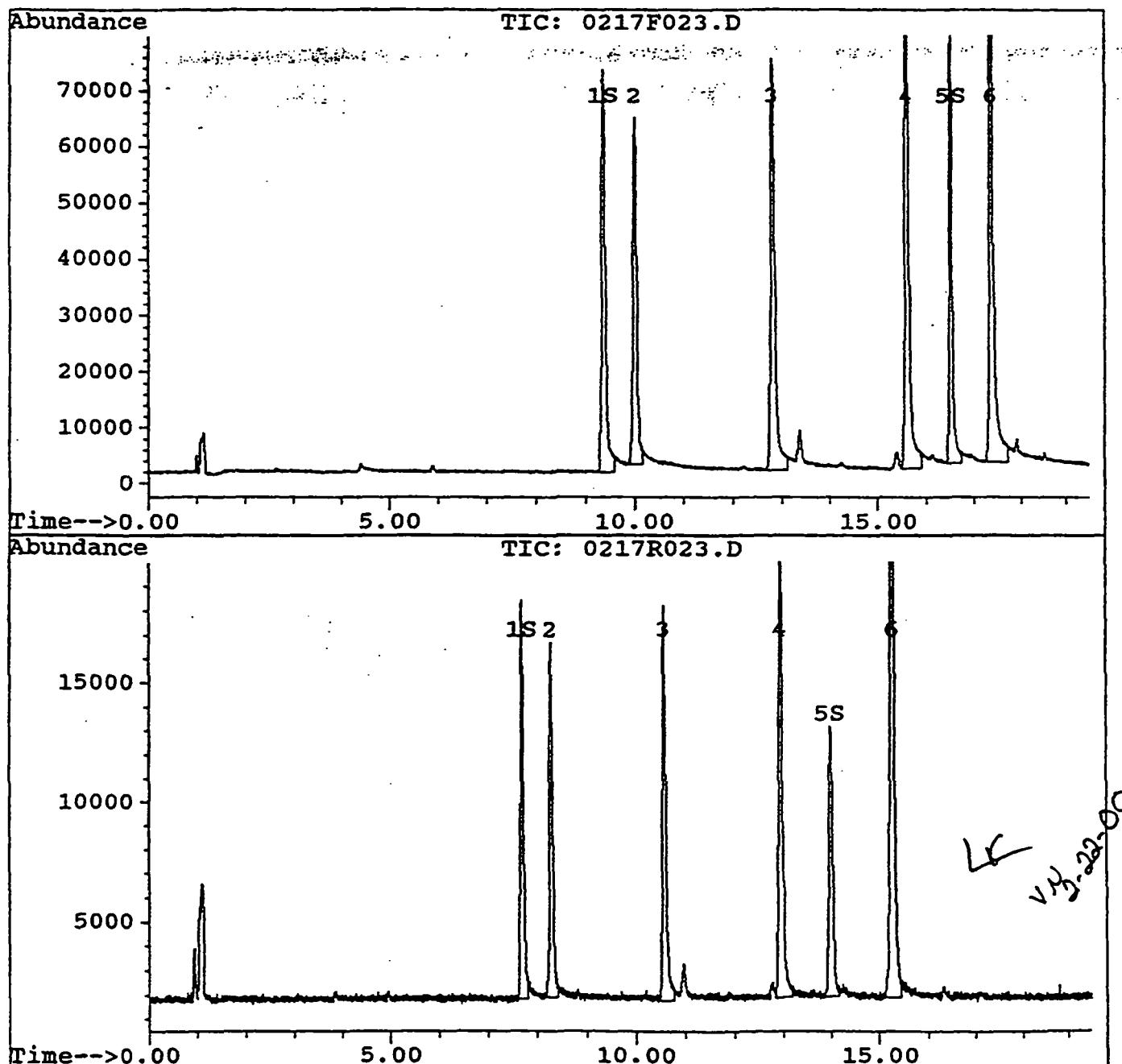
Page 1  
00053

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F023.D Vial: 3  
 Signal #2 : J:\GC11\DATA\021700\0217F023.D\0217R023.D  
 Acq On : 18 Feb 00 01:04 AM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100217\CCV-6K.H | Multiplr: 1.00  
 Quant Time: Feb 18 9:39 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\021700\0217F035.D Vial: 2  
 Signal #2 : J:\GC11\DATA\021700\0217F035.D\0217R035.D  
 Acq On : 18 Feb 00 05:49 AM Operator: lkennedy  
 Sample : K000217-IB-EI Inst : GC11  
 Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
 Quant Time: Feb 18 9:45 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<hr/>						
System Monitoring Compounds						
S Tri-n-propyltin	9.46f	0.00	1216	0	1.595	N.D. #
Recovery						
S' Tri-n-pentyltin	0.00	0.00	0	0	N.D.	N.D.
Recovery						
Target Compounds						
Tetra-n-butyltin	10.07f	0.00	539	0	0.771	N.D. #
Tri-n-butyltin	0.00	10.53	0	697	N.D.	4.154 #
Di-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
n-Butyltin	0.00	0.00	0	0	N.D.	N.D.

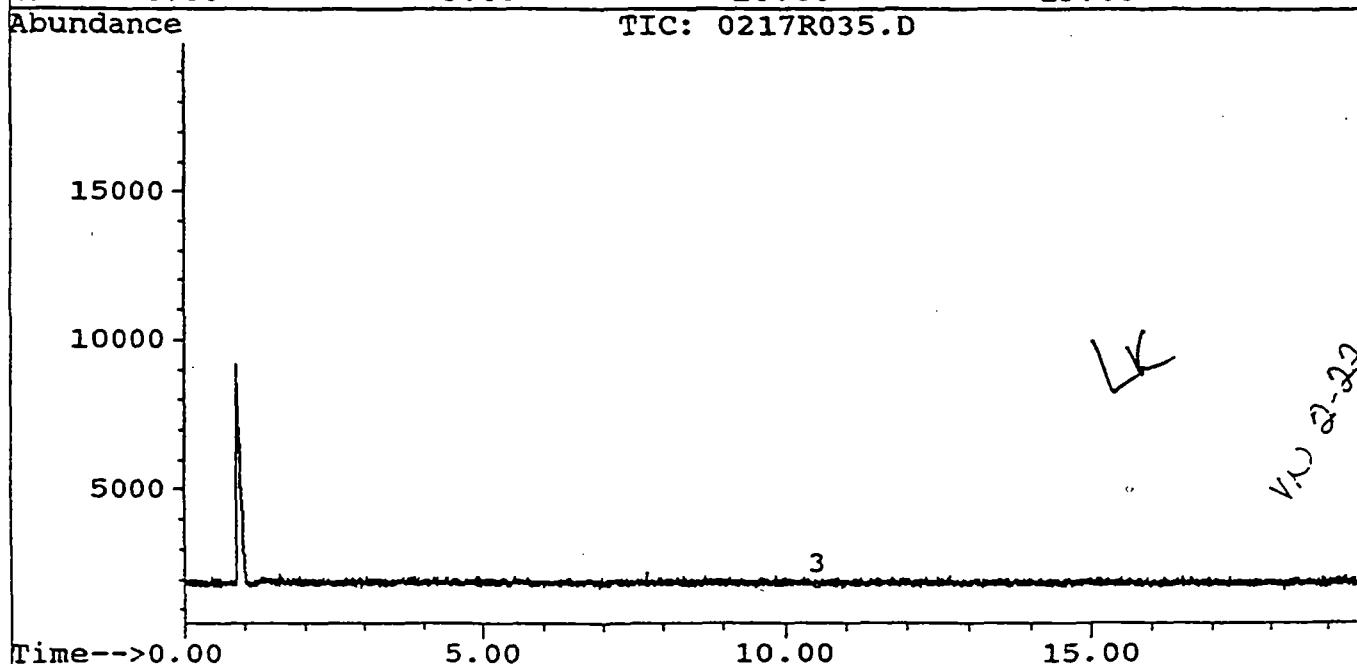
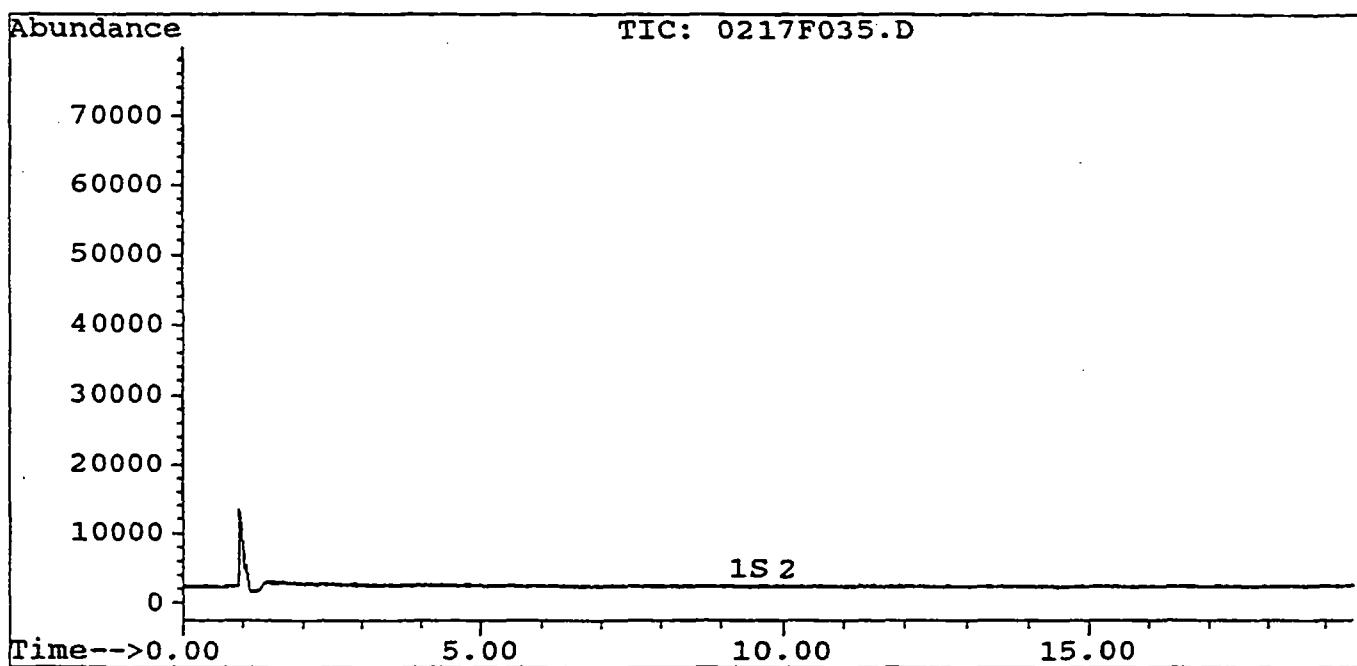
lk  
2/18/00  
lk 2/22/00

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F035.D Vial: 2  
Signal #2 : J:\GC11\DATA\021700\0217F035.D\0217R035.D  
Acq On : 18 Feb 00 05:49 AM Operator: lkennedy  
Sample : K000217-IB-EI Inst : GC11  
Misc : SVG\qc\K100217\IB-EI.H | F=2 D=1 A=690 Multiplr: 1.00  
Quant Time: Feb 18 9:45 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F036.D Vial: 3  
 Signal #2 : J:\GC11\DATA\021700\0217F036.D\0217R036.D  
 Acq On : 18 Feb 00 06:13 AM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100217\CCV-6K.H | Multiplr: 1.00  
 Quant Time: Feb 18 9:46 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Fri Feb 18 09:43:00 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
----------	------	------	--------	--------	-------	-------

**System Monitoring Compounds**

S	Tri-n-propyltin	9.36	7.69	379608	70324	498.059	473.525
				Recovery	=	99.61%	94.71%
S	Tri-n-pentyltin	16.51	13.96	309772	59215	485.654	482.698
				Recovery	=	97.13%	96.54%

**Target Compounds**

Tetra-n-butyltin	9.99	8.28	339401	61837	485.717	512.279 <sup>TV</sup> <del>490</del>
Tri-n-butyltin	12.79	10.55	423970	80715	484.880	481.010 <del>475</del>
Di-n-butyltin	15.58	12.92	547111	99839	513.060	463.9995 <del>16</del>
n-Butyltin	17.35	15.25	747740	137454	510.316	446.2564 <del>90</del>

LK  
2/18/00  
LK 2/22/00

)=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 17F036.D 0209TINS.M Fri Feb 18 09:58:37 2000

# Quantitation Report

Signal #1 : J:\GC11\DATA\021700\0217F036.D Vial: 3  
Signal #2 : J:\GC11\DATA\021700\0217F036.D\0217R036.D Operator: lkennedy  
Acq On : 18 Feb 00 06:13 AM Inst : GC11  
Sample : OT @ 500ug/L | OT2-73-B Multiplr: 1.00  
Misc : SVG\qc\K100217\CCV-6K.H |  
Quant Time: Feb 18 9:46 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Fri Feb 18 09:43:00 2000  
Response via : Multiple Level Calibration

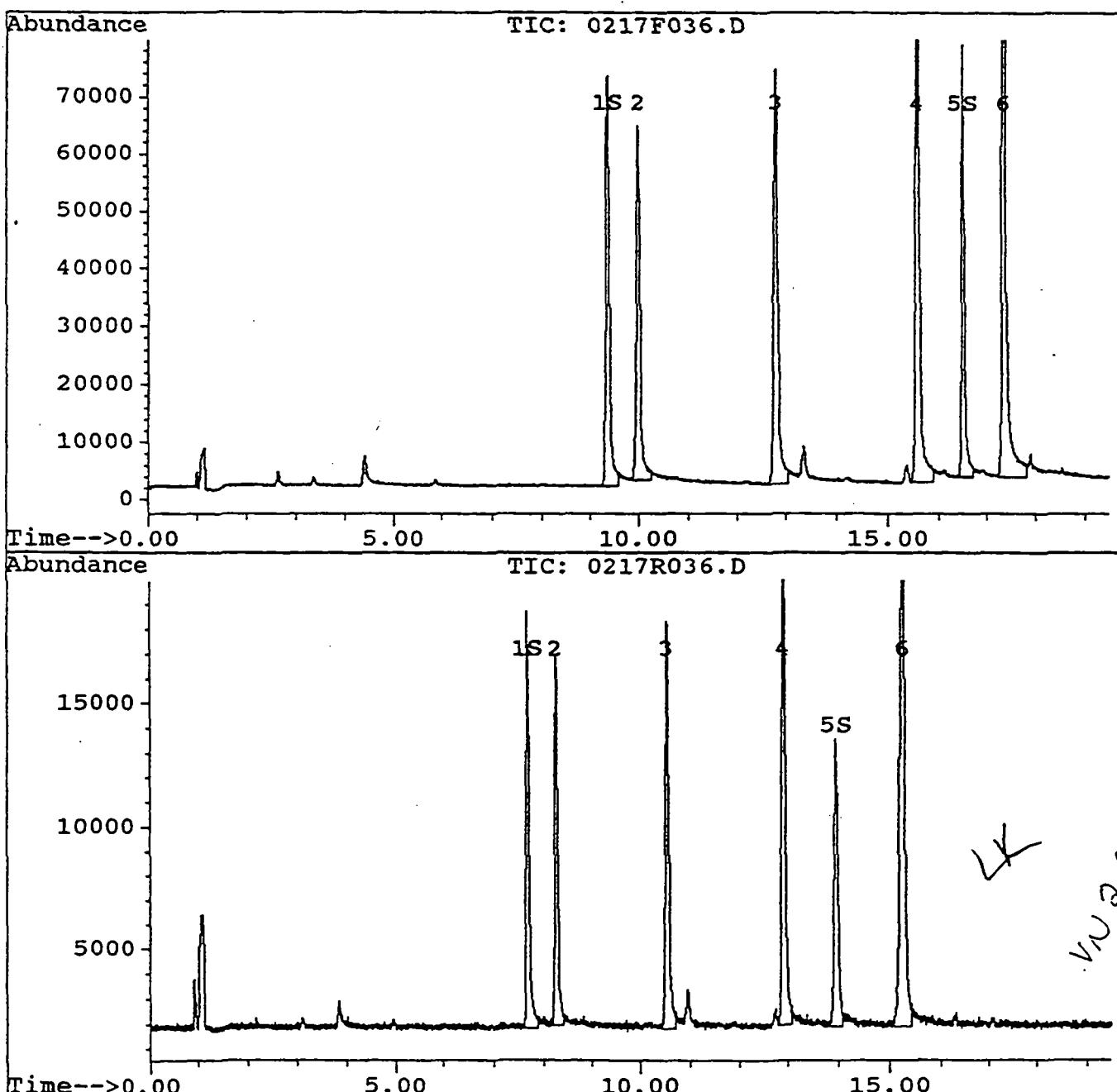
Volume Inj. :

Signal #1 Phase : RTX-50

Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200

Signal #2 Info : 0.53mm id.



## Instrument Type: HP 5890 II (OMC)

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysts Lot	IS/Surr Solution ID	Date and Time
									Comments
									Acceptability Criteria
									QC Solution IDs
K000209-IB-DM	0209F001.D		1	TINS.M	lkennedy		O11K000209		09 Feb 00 11:38 AM
									NA
K000209-IB-DM	0209F002.D		1	TINS.M	lkennedy		O11K000209		09 Feb 00 12:02 PM
									NA
K000209-IB-DM	0209F003.D		1	TINS.M	lkennedy		O11K000209		09 Feb 00 12:26 PM
									NA
K000209-IB-DM	0209F004.D		1	TINS.M	lkennedy		O11K000209		09 Feb 00 12:50 PM
									NA
K000209-IB-DN	0209F005.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 01:14 PM
									NA
K000209-IB-DN	0209F006.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 01:37 PM
									NA
K000209-IB-DN	0209F007.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 02:01 PM
									NA
K000209-IB-DN	0209F008.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 02:25 PM
									NA
K000209-IB-DN	0209F009.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 02:49 PM
									NA
K000209-CCV-3S	0209F010.D		3	TINS.M	lkennedy		O11K000209		09 Feb 00 03:13 PM
									OT2-73-B
K000209-CCV-3S	0209F011.D		4	TINS.M	lkennedy		O11K000209		09 Feb 00 03:37 PM
									OT2-73-B
K000209-CCV-3S	0209F012.D		5	TINS.M	lkennedy		O11K000209		09 Feb 00 04:01 PM
									OT2-73-B
K000209-CCV-3S	0209F013.D		6	TINS.M	lkennedy		O11K000209		09 Feb 00 04:24 PM
									OT2-73-B
K000209-CCV-3S	0209F014.D		7	TINS.M	lkennedy		O11K000209		09 Feb 00 04:48 PM
									OT2-73-B

Overall Sequence Comments:

JCAL

Primary Review:

LK

Date: 2-10-00

Secondary Review:

VA

Date: 2-11-00

Page Number: 1

## INSTRUMENT TYPE: ICP-MS

Lab Identifier	Data File	Client Sample ID	ALS	Method File	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
Comments					Acceptability Criteria			QC Solution IDs	
K000209-CCV-SS	0209F015.D		8	TINS.M	lkennedy		G11K000209		09 Feb 00 05:12 PM
								OT2-73-B	
K000209-IB-DN	0209F016.D		2	TINS.M	lkennedy		G11K000209		09 Feb 00 05:36 PM
								NA	
K000209-CCV-SS	0209F017.D		9	TINS.M	lkennedy		G11K000209		09 Feb 00 06:00 PM
								OT2-73-B	
K000209-SOLN-L3	0209F018.D		10	TINS.M	lkennedy		G11K000209		09 Feb 00 06:24 PM
								GR 83	
K000209-SOLN-L4	0209F019.D		11	TINS.M	lkennedy		G11K000209		09 Feb 00 06:48 PM
								GR 83	
K000209-SOLN-L5	0209F020.D		12	TINS.M	lkennedy		G11K000209		09 Feb 00 07:12 PM
								GR 83	
K000209-SOLN-L6	0209F021.D		13	TINS.M	lkennedy		G11K000209		09 Feb 00 07:35 PM
								GR 83	
KWO2000417-3	0209F022.D	Method Blank	14	TINS.M	lkennedy		G11K000209		09 Feb 00 07:59 PM
KWO2000417-1	0209F023.D	Lab Control Sample	15	TINS.M	lkennedy		G11K000209		09 Feb 00 08:23 PM
KWO2000417-2	0209F024.D	Duplicate Lab Control Sample	16	TINS.M	lkennedy		G11K000209		09 Feb 00 08:47 PM
K2000798-001	0209F025.D	0005SP12005F	17	TINS.M	lkennedy		G11K000209		09 Feb 00 09:11 PM
KWO2000437-4	0209F026.D	Method Blank	18	TINS.M	lkennedy		G11K000209		09 Feb 00 09:35 PM
KWO2000437-3	0209F027.D	Lab Control Sample	19	TINS.M	lkennedy		G11K000209		09 Feb 00 09:59 PM
K2000745-001	0209F028.D	HC-L01-C04	20	TINS.M	lkennedy		G11K000209		09 Feb 00 10:23 PM

Overall Sequence Comments:

00060

Primary Review: LKDate: 2-10-00Secondary Review: VADate: 2-11-00Page Number: 2

Analysis Type: FTG 5090 II

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
									Comments
									Acceptability Criteria
									QC Solution IDs
K2000745-002	0209F029.D	HC-L01-C05	21	TINS.M	lkennedy		O11K000209		09 Feb 00 10:47 PM
K2000745-003	0209F030.D	HC-L01-C06	22	TINS.M	lkennedy		O11K000209		09 Feb 00 11:11 PM
K2000768-001	0209F031.D	HC-L01-C07	23	TINS.M	lkennedy		O11K000209		09 Feb 00 11:34 PM
K000209-IB-DN	0209F032.D		2	TINS.M	lkennedy		O11K000209		09 Feb 00 11:58 PM
K000209-IB-DN	0209F033.D		2	TINS.M	lkennedy		O11K000209		10 Feb 00 00:22 AM
K000209-CCV-S	0209F034.D		6	TINS.M	lkennedy		O11K000209		10 Feb 00 00:46 AM
K2000768-002	0209F035.D	HC-L02-PB	24	TINS.M	lkennedy		O11K000209		10 Feb 00 01:09 AM
K2000768-003	0209F036.D	HC-L02-LW	25	TINS.M	lkennedy		O11K000209		10 Feb 00 01:33 AM
KWG2000437-1	0209F037.D	Matrix Spike	26	TINS.M	lkennedy		O11K000209		10 Feb 00 01:57 AM
KWG2000437-2	0209F038.D	Duplicate Matrix Spike	27	TINS.M	lkennedy		O11K000209		10 Feb 00 02:21 AM
KWG2000444-4	0209F039.D	Method Blank	28	TINS.M	lkennedy		O11K000209		10 Feb 00 02:45 AM
KWG2000444-3	0209F040.D	Lab Control Sample	29	TINS.M	lkennedy		O11K000209		10 Feb 00 03:08 AM
K2000645-003	0209F041.D	S+Q-S-LB10(3-6.5)	30	TINS.M	lkennedy		O11K000209		10 Feb 00 03:32 AM
K2000645-006	0209F042.D	S+Q-S-LB10(12.5-14)	31	TINS.M	lkennedy		O11K000209		10 Feb 00 03:56 AM

Overall Sequence Comments:

Primary Review: LKDate: 2-10-00Secondary Review: VJDate: 2-11-00Page Number: 3

## Instrument Type: HP 5890 II

Lab Identifier	Data File	Client Sample ID	ALS	Method File	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
Comments					Acceptability Criteria			QC Solution IDs	
K2000645-008	0209F043.D	S+G-S-LB10(19-20.5)	32	TINS.M	lkennedy		G11K000209		10 Feb 00 04:20 AM
K2000645-010	0209F044.D	S+G-S-LB10(23-26.5)	33	TINS.M	lkennedy		G11K000209		10 Feb 00 04:43 AM
K000209-IB-DN	0209F045.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 05:07 AM
K000209-IB-DN	0209F046.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 05:31 AM
K000209-CCV-SS	0209F047.D		6	TINS.M	lkennedy		G11K000209		10 Feb 00 05:55 AM
								OT2-73-B	
K2000645-013	0209F048.D	S+G-S-LB10(49-50.5)	34	TINS.M	lkennedy		G11K000209		10 Feb 00 06:19 AM
K2000645-014	0209F049.D	S+G-S-LB10(53-56.5)	35	TINS.M	lkennedy		G11K000209		10 Feb 00 06:43 AM
K2000510-002	0209F050.D	S+G-S-LB13(27.5-29)	36	TINS.M	lkennedy		G11K000209		10 Feb 00 07:06 AM
K2000510-014	0209F051.D	S+G-S-LB11(12.5-14)	37	TINS.M	lkennedy		G11K000209		10 Feb 00 07:30 AM
KWG2000444-1	0209F052.D	Matrix Spike	38	TINS.M	lkennedy		G11K000209		10 Feb 00 07:54 AM
KWG2000444-2	0209F053.D	Duplicate Matrix Spike	39	TINS.M	lkennedy		G11K000209		10 Feb 00 08:18 AM
KWG2000220-5	0209F054.D	Method Blank	40	TINS.M	lkennedy		G11K000209		10 Feb 00 08:42 AM
KWG2000220-3	0209F055.D	Lab Control Sample	41	TINS.M	lkennedy		G11K000209		10 Feb 00 09:06 AM
KWG2000220-4	0209F056.D	Lab Control Sample	42	TINS.M	lkennedy		G11K000209		10 Feb 00 09:29 AM

Overall Sequence Comments:

Primary Review:

LICDate: 2-10-00

Secondary Review:

NADate: 2-11-00Page Number: 4

00062

Lab Identifier	DataFile	Client Sample ID	ALS	MethodFile	Seq Operator	Accepted By...	Analysis Lot	IS/Surr Solution ID	Date and Time
Comments					Acceptability Criteria		QC Solution IDs		
KWO2000220-1	0209F057.D	Standard Reference Material	43	TINS.M	lkennedy		G11K000209		10 Feb 00 09:53 AM
K000209-IB-DN	0209F058.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 10:17 AM
K000209-IB-DN	0209F059.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 10:41 AM
K000209-CCV-3S	0209F060.D		6	TINS.M	lkennedy		G11K000209		10 Feb 00 11:05 AM
KWO2000220-2	0209F061.D	Standard Reference Material	44	TINS.M	lkennedy		G11K000209		10 Feb 00 11:29 AM
K000209-IB-DN	0209F062.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 11:53 AM
K000209-IB-DN	0209F063.D		2	TINS.M	lkennedy		G11K000209		10 Feb 00 12:17 PM
K000209-CCV-3S	0209F064.D		6	TINS.M	lkennedy		G11K000209		10 Feb 00 12:41 PM
								OT2-73-B	

Overall Sequence Comments:

Primary Review: LC  
 Secondary Review: VN

Date: 2-10-00  
 Date: 2-11-00

Page Number: 5

Sequence Name: J:\GC11\SEQUENCE\020900.S

Comment:

Operator: lkennedy

Data Path: J:\GC11\DATA\020900\

Pre-Seq Cmd:

Post-Seq Cmd:

Method Sections To Run On A Barcode Mismatch

- (X) Full Method (X) Inject Anyway  
( ) Reprocessing Only ( ) Don't Inject

Line Type Vial DataFile Method Sample Name

1	DeleteGC			
2	MaskName	- -----R---		
3	IB	1 0209F001 TINS	DCM	
4	IB	1 0209F002 TINS	DCM	
5	IB	1 0209F003 TINS	DCM	
6	IB	1 0209F004 TINS	DCM	
7	IB	2 0209F005 TINS	K000209-IB-DN	
8	IB	2 0209F006 TINS	K000209-IB-DN	
9	IB	2 0209F007 TINS	K000209-IB-DN	
10	IB	2 0209F008 TINS	K000209-IB-DN	
11	IB	2 0209F009 TINS	K000209-IB-DN	
12	ICAL	3 0209F010 TINS	OT @ 10ug/L   OT2-73-B	
13	ICAL	4 0209F011 TINS	OT @ 50ug/L   OT2-73-B	
14	ICAL	5 0209F012 TINS	OT @ 100ug/L   OT2-73-B	
15	CCV	6 0209F013 TINS	OT @ 500ug/L   OT2-73-B	
16	ICAL	7 0209F014 TINS	OT @ 1000ug/L   OT2-73-B	
17	ICAL	8 0209F015 TINS	OT @ 2000ug/L   OT2-73-B	
18	IB	2 0209F016 TINS	K000209-IB-DN	
19	ICV	9 0209F017 TINS	OT @ 500ug/L   OT2-68-E	
20	SOLN	10 0209F018 TINS	K000209-SOLN-L3 @ 0ug/L	
21	SOLN	11 0209F019 TINS	K000209-SOLN-L4 @ 1ug/L	
22	SOLN	12 0209F020 TINS	K000209-SOLN-L5 @ 10ug/L	
23	SOLN	13 0209F021 TINS	K000209-SOLN-L6 @ 10ug/L	
24	MB	14 0209F022 TINS	KWG2000417-3   MB   H2O   TIN-SVG	
25	LCS	15 0209F023 TINS	KWG2000417-1   LCS   H2O   TIN-SVG	
26	DLCS	16 0209F024 TINS	KWG2000417-2   DLCS   H2O   TIN-SVG	
27	SMPL	17 0209F025 TINS	K2000798-001   0005SF12005F	
28	MB	18 0209F026 TINS	KWG2000437-4   MB   H2O   TIN-SVG	
29	LCS	19 0209F027 TINS	KWG2000437-3   LCS   H2O   TIN-SVG	
30	SMPL	20 0209F028 TINS	K2000745-001   HC-L01-C04	
31	SMPL	21 0209F029 TINS	K2000745-002   HC-L01-C05	
32	SMPL	22 0209F030 TINS	K2000745-003   HC-L01-C06	
33	SMPL	23 0209F031 TINS	K2000768-001   HC-L01-C07	
34	IB	2 0209F032 TINS	K000209-IB-DN	
35	IB	2 0209F033 TINS	K000209-IB-DN	
36	CCV	6 0209F034 TINS	OT @ 500ug/L   OT2-73-B	
37	SMPL	24 0209F035 TINS	K2000768-002   HC-L02-PB	
38	SMPL	25 0209F036 TINS	K2000768-003   HC-L02-LW	
39	MS	26 0209F037 TINS	KWG2000437-1   K2000768-003MS   TIN-S	
40	DMS	27 0209F038 TINS	KWG2000437-2   K2000768-003DMS   TIN-	
41	MB	28 0209F039 TINS	KWG2000444-4   MB   SOIL   TIN-SVG	
42	LCS	29 0209F040 TINS	KWG2000444-3   LCS   SOIL   TIN-SVG	
43	SMPL	30 0209F041 TINS	K2000645-003   S+G-S-LB10(5-6.5)	

st Modified: Wed Feb 09 11:30:57 2000

Page: 1

00064

## Sequence Name: J:\GC11\SEQUENCE\020900.S

Line	Type	Vial	DataFile	Method	Sample Name
44	SMPL	31	0209F042	TINS	K2000645-006   S+G-S-LB10(12.5-14)
45	SMPL	32	0209F043	TINS	K2000645-008   S+G-S-LB10(19-20.5)
46	SMPL	33	0209F044	TINS	K2000645-010   S+G-S-LB10(25-26.5)
47	IB	2	0209F045	TINS	K000209-IB-DN
48	IB	2	0209F046	TINS	K000209-IB-DN
49	CCV	6	0209F047	TINS	OT @ 500ug/L   OT2-73-B
50	SMPL	34	0209F048	TINS	K2000645-013   S+G-S-LB10(49-50.5)
51	SMPL	35	0209F049	TINS	K2000645-014   S+G-S-LB10(55-56.5)
52	REX	36	0209F050	TINS	K2000510-002REX   S+G-S-LB13(27.5-29)
53	REX	37	0209F051	TINS	K2000510-014REX   S+G-S-LB11(12.5-14)
54	MS	38	0209F052	TINS	KWG2000444-1   K2000510-014MS   TIN-S
55	DMS	39	0209F053	TINS	KWG2000444-2   K2000510-014DMS   TIN-
56	MB	40	0209F054	TINS	MB   TISSUE   TIN-SVG
57	LCS	41	0209F055	TINS	KWG2000220-3   LCS   TISSUE   TIN-SVG
58	LCS	42	0209F056	TINS	KWG2000220-4   LCS   TISSUE   TIN-SVG
59	LCS	43	0209F057	TINS	KWG2000220-1   SRM   TISSUE   TIN-SVG
60	IB	2	0209F058	TINS	K000209-IB-DN
61	IB	2	0209F059	TINS	K000209-IB-DN
62	CCV	6	0209F060	TINS	OT @ 500ug/L   OT2-73-B
63	LCS	44	0209F061	TINS	KWG2000220-2   SRM   TISSUE   TIN-SVG
64	IB	2	0209F062	TINS	K000209-IB-DN
65	IB	2	0209F063	TINS	K000209-IB-DN
66	CCV	6	0209F064	TINS	OT @ 500ug/L   OT2-73-B

## Response Factor Report GC11

hod : J:\GC11\METHODS\0209TINS.M  
 le : Butyltins by GC-FPD  
 t Update : Thu Feb 10 09:52:57 2000  
 ponse via : Initial Calibration

## ibration Files

> =0209F015.D 10 =0209F010.D 50 =0209F011.D  
 =0209F012.D 500 =0209F013.D 1000 =0209F014.D

Compound	ID	50	100	500	1000	2000	1000	Avg	%RSD
S Tri-n-propyltin	814.6	796.5	763.7	775.3	720.0	703.0	762.2	5.68	
Tetra-n-butyltin	822.1	719.7	681.7	677.7	646.2	645.1	698.8	9.50	
Tri-n-butyltin	888.8	895.3	880.1	894.9	853.6	833.5	874.4	2.89	
Di-n-butyltin	1.2	1.1	1.1	1.0	1.0	1.0	1.1 E3	8.66	
S Tri-n-pentyltin	700.8	687.5	642.1	611.5	607.5	577.7	637.8	7.58	
n-Butyltin	1.7	1.5	1.5	1.4	1.4	1.3	1.5 E3	9.22	

## l #2 Calibration Files

= 10 =0209R010.D 50 =0209R011.D  
 =0209R012.D 500 =0209R013.D 1000 =0209R014.D

Compound	ID	50	100	500	1000	2000	1000	Avg	%RSD
S Tri-n-propyltin	182.0	153.2	127.8	141.3	142.2	144.6	148.5	12.34	
Tetra-n-butyltin	84.7	120.4	128.8	130.0	128.7	131.6	120.7	14.97	
Tri-n-butyltin	148.3	176.0	166.9	170.0	173.4	172.2	167.8	5.97	
Di-n-butyltin	270.2	209.5	207.9	202.4	198.7	202.2	215.2	12.66	
S Tri-n-pentyltin	131.1	123.9	119.4	118.6	123.0	120.2	122.7	3.77	
n-Butyltin	399.6	304.5	286.3	287.7	284.4	285.6	308.0	14.77	

= Out of Range ### Number of calibration levels exceeded format ###

0209TINS.M

Thu Feb 10 09:55:48 2000

JK  
2-10-00  
JK 2-11-00

00066

Calibration Status Report GC11

hod : J:\GC11\METHODS\0209TINS.M  
le : Butyltins by GC-FPD  
t Update : Thu Feb 10 09:52:57 2000  
ponse via : Initial Calibration

D Conc ISTD Path\File  
Conc

D	Conc	ISTD	Path\File
0	9.80	0.00	J:\GC11\DATA\020900\0209F010.D
0	49.00	0.00	J:\GC11\DATA\020900\0209F011.D
00	98.00	0.00	J:\GC11\DATA\020900\0209F012.D
00	490.00	0.00	J:\GC11\DATA\020900\0209F013.D
000	980.00	0.00	J:\GC11\DATA\020900\0209F014.D

D Update Time Quant Time Acquisition Time

D	Update Time	Quant Time	Acquisition Time
0	Feb 10 09:52 2000	Feb 10 09:49 19100	09 Feb 00 03:13 PM
0	Feb 10 09:09 2000	Feb 10 08:52 19100	09 Feb 00 03:37 PM
00	Feb 10 09:09 2000	Feb 10 08:52 19100	09 Feb 00 04:01 PM
00	Feb 10 09:10 2000	Feb 10 08:53 19100	09 Feb 00 04:24 PM
000	Feb 10 09:10 2000	Feb 10 08:53 19100	09 Feb 00 04:48 PM

,TINS.M

Thu Feb 10 09:57:00 2000

UK  
2/10/00  
W 2/11/00

00067

## DATA ANALYSIS PARAMETERS

---

i Name: J:\GC11\METHODS\0209TINS.M

### it Report Settings

---

3y: Signal

: Destination

reen: No

inter: No

le: temp.d

cation Events: Meth Default

ite Report During Run Method: No

Correlation Window: 0.020

### tative Report Settings

---

Type: Summary

: Destination

reen: No

inter: Yes

le: No

te Report During Run Method: No

ins by GC-FPD

ation Last Updated: Thu Feb 10 09:52:57 2000

nce Window: 0.03 Minutes

ference Window: 5.00 Percent

ation Window: 0.02 minutes

t Multiplier: 1.00

t Sample Concentration: 0.00

### nd Information

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ri-n-propyltin

( )

vt  
2/10-00

00068

Time 9.41 min., Extract & Integrate from 9.31 to 9.51 min.

ID	Conc (ng/ml)	Response
	10.000	8146
	50.000	39826
	100.000	76366
	500.000	387651
	1000.000	719962
	2000.000	1406002

Fit: Avg. RF

Tetra-n-butyltin

Time 10.04 min., Extract & Integrate from 9.94 to 10.14 min.

ID	Conc (ng/ml)	Response
	9.800	8057
	49.000	35266
	98.000	66806
	490.000	332090
	980.000	633230
	1960.000	1264467

Fit: Avg. RF

Tri-n-butyltin

Time 12.85 min., Extract & Integrate from 12.75 to 12.95 min.

ID	Conc (ng/ml)	Response
	9.500	8444
	47.500	42528
	95.000	83605
	475.000	425094
	950.000	810930
	1900.000	1583687

Fit: Avg. RF

Di-n-butyltin

Time 15.63 min., Extract & Integrate from 15.53 to 15.73 min.

ID	Conc (ng/ml)	Response
	10.200	12535
	51.000	56002
	102.000	108899
	510.000	526359
	1020.000	1028837
	2040.000	1964174

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2/10/00

Fit: Avg. RF

Tri-n-pentyltin

00069

Time 16.54 min., Extract & Integrate from 16.44 to 16.64 min.

D	Conc (ng/ml)	Response
	10.000	7008
	50.000	34373
	100.000	64211
	500.000	305746
	1000.000	607535
	2000.000	1155352

Fit: Avg. RF

n-Butyltin

Time 17.37 min., Extract & Integrate from 17.27 to 17.47 min.

D	Conc (ng/ml)	Response
	9.800	16621
	49.000	74926
	98.000	142360
	490.000	704033
	980.000	1330491
	1960.000	2585778

Fit: Avg. RF

Signal #2

Time 11.44 min., Extract & Integrate from 11.34 to 11.54 min.

D	Conc (ng/ml)	Response
	not used for this compound	
	not used for this compound	
	not used for this compound	
	not used for this compound	
	not used for this compound	
	not used for this compound	

Fit: Avg. RF

Tri-n-propyltin #2

Time 7.72 min., Extract & Integrate from 7.62 to 7.82 min.

D	Conc (ng/ml)	Response
	10.000	1820
	50.000	7660
	100.000	12778
	500.000	70648
	1000.000	142243
	2000.000	289102

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2/10/00

Fit: Avg. RF

Tetra-n-butyltin #2

( )

00070

Time 8.30 min., Extract & Integrate from 8.20 to 8.40 min.

Conc (ng/ml)	Response
9.800	830
49.000	5901
98.000	12624
490.000	63695
980.000	126121
1960.000	258002

Fit: Avg. RF

tri-n-butyltin #2

Time 10.58 min., Extract & Integrate from 10.48 to 10.68 min.

Conc (ng/ml)	Response
9.500	1409
47.500	8358
95.000	15859
475.000	80749
950.000	164720
1900.000	327222

Fit: Avg. RF

tri-n-butyltin #2

Time 12.95 min., Extract & Integrate from 12.85 to 13.05 min.

Conc (ng/ml)	Response
10.200	2756
51.000	10687
102.000	21205
510.000	103243
1020.000	202682
2040.000	412574

Fit: Avg. RF

tri-n-pentyltin #2

Time 13.98 min., Extract & Integrate from 13.88 to 14.08 min.

Conc (ng/ml)	Response
10.000	1311
50.000	6194
100.000	11935
500.000	59277
1000.000	123003
2000.000	240326

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21070

Fit: Avg. RF

-Butyltin #2

( )

00071

ime 15.25 min., Extract & Integrate from 15.15 to 15.35 min.

Conc (ng/ml)	Response
9.800	3916
49.000	14921
98.000	28057
490.000	140974
980.000	278694
1960.000	559802

Fit: Avg. RF

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END OF DATA ANALYSIS PARAMETERS

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Thu Feb 10 09:57:01 2000

UK  
2/10/00

00072

# Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F010.D Vial: 3  
 Signal #2 : J:\GC11\DATA\020900\0209F010.D\0209R010.D  
 Acq On : 09 Feb 00 03:13 PM Operator: lkennedy  
 Sample : OT @ 10ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 9:49 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:38:49 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
Tri-n-propyltin	9.42	7.72	8146	1820	13.375	13.630
			Recovery	=	2.68%	2.73%
Tri-n-pentyltin	16.56	14.00	7008	1311	13.561	11.723
			Recovery	=	2.71%	2.34%
<b>Target Compounds</b>						
Tetra-n-butyltin	10.06	8.31	8057	830	14.217	6.358 #
Tri-n-butyltin	12.87	10.60	8444	1409	11.863	8.672m#
Di-n-butyltin	15.66	12.97	12535	2756	14.861	14.244
n-Butyltin	17.38	15.28	16621	3916	14.220	14.885

2/10/00

2/10/00  
2/11/00

RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 F010.D 0209TINS.M Thu Feb 10 09:50:18 2000

Page 1

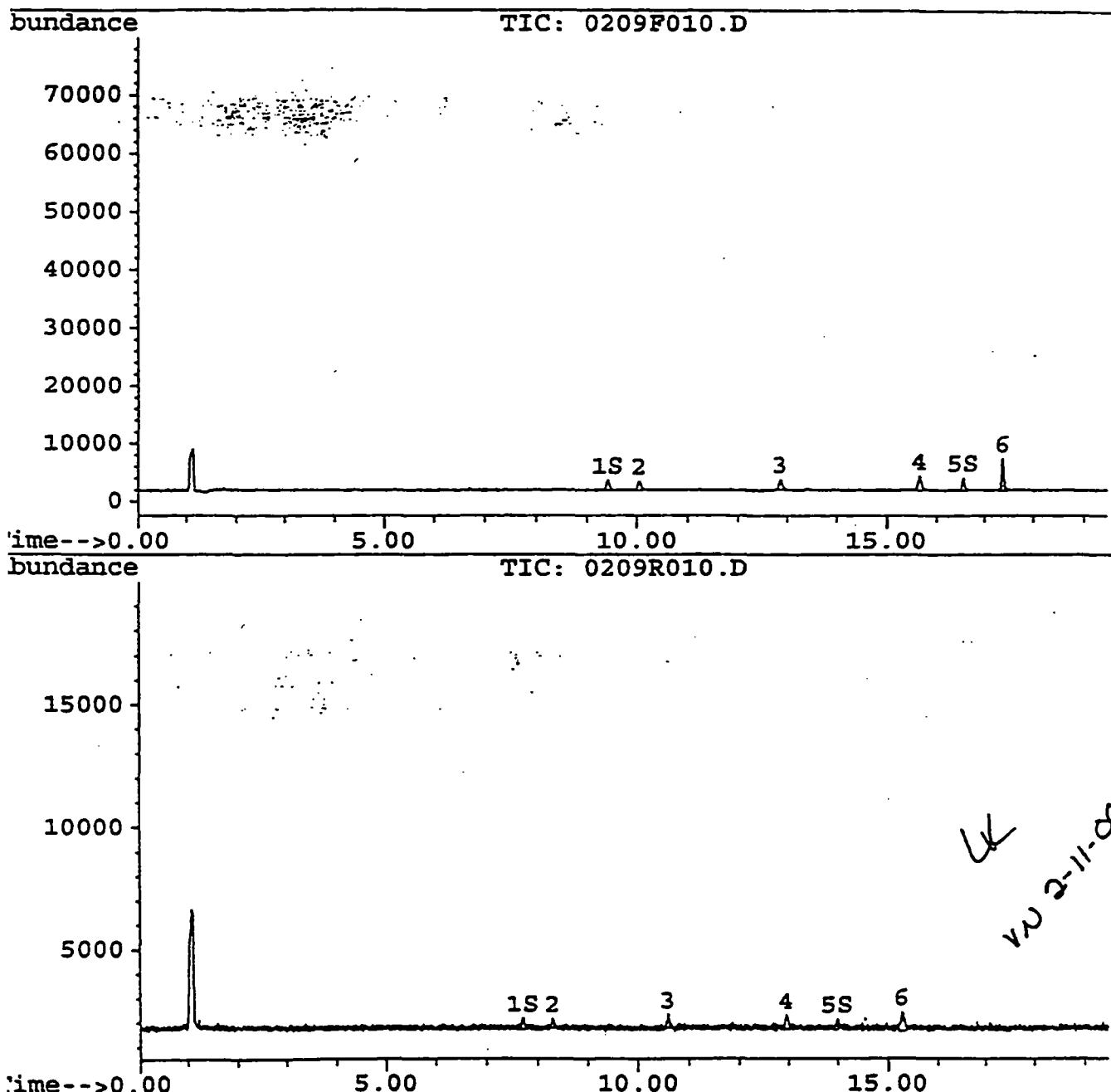
00073

# Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F010.D Vial: 3  
Signal #2 : J:\GC11\DATA\020900\0209F010.D\0209R010.D Operator: lkennedy  
Acq On : 09 Feb 00 03:13 PM Inst : GC11  
Sample : OT @ 10ug/L | OT2-73-B Multiplr: 1.00  
Misc : SVG\qc\K100209\CCV-5S.H |  
Quant Time: Feb 10 9:49 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 09:38:49 2000  
Response via : Multiple Level Calibration

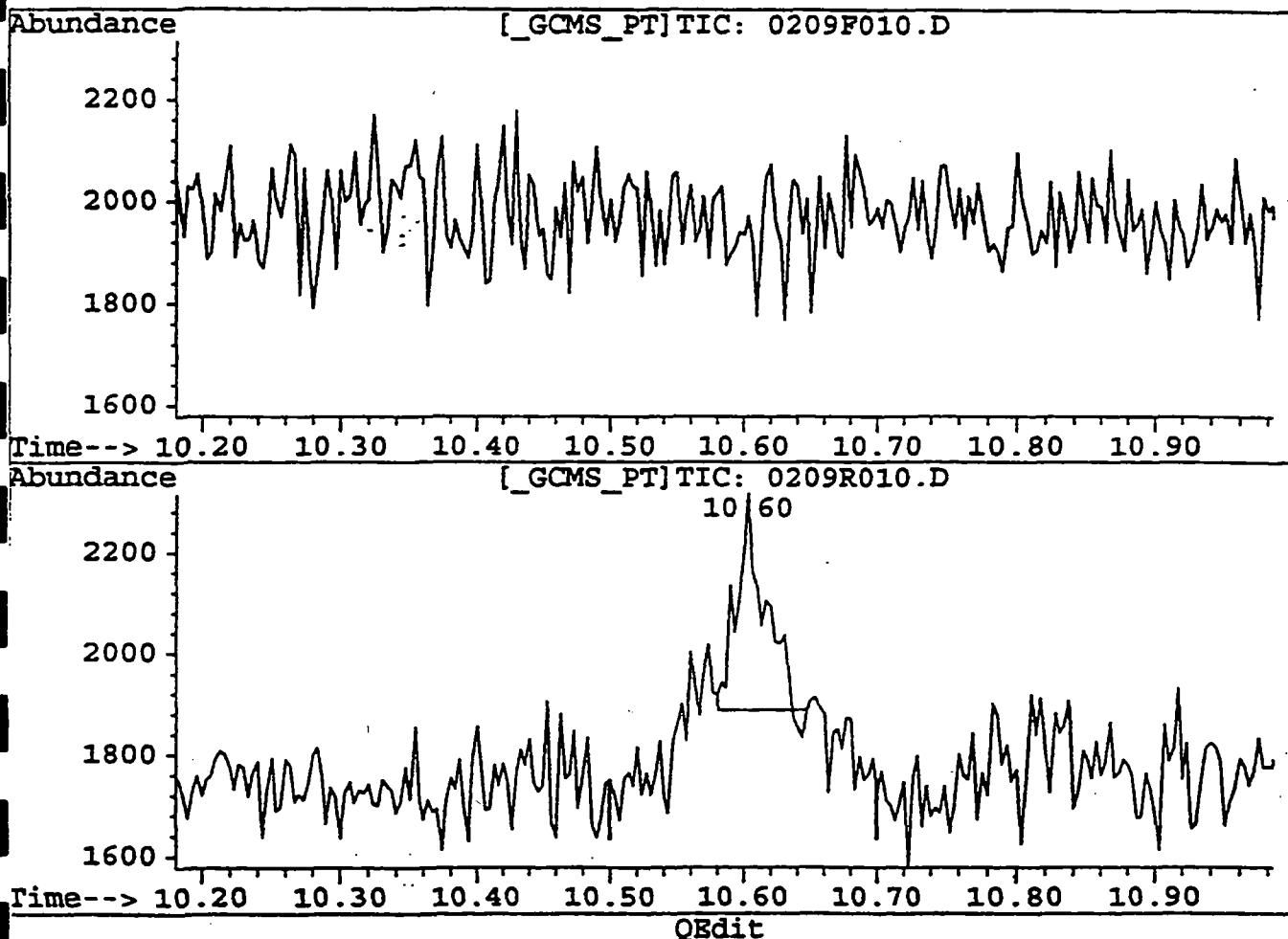
Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F010.D Vial: 3  
 Signal #2 : J:\GC11\DATA\020900\0209F010.D\0209R010.D  
 Acq On : 09 Feb 00 03:13 PM Operator: lkennedy  
 Sample : OT @ 10ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:51 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:38:49 2000  
 Response via : Multiple Level Calibration



(3) Tri-n-butyltin  
12.87min 11.86ng/ml  
response 8444

*Before integ too*

*ret 10/10/00*

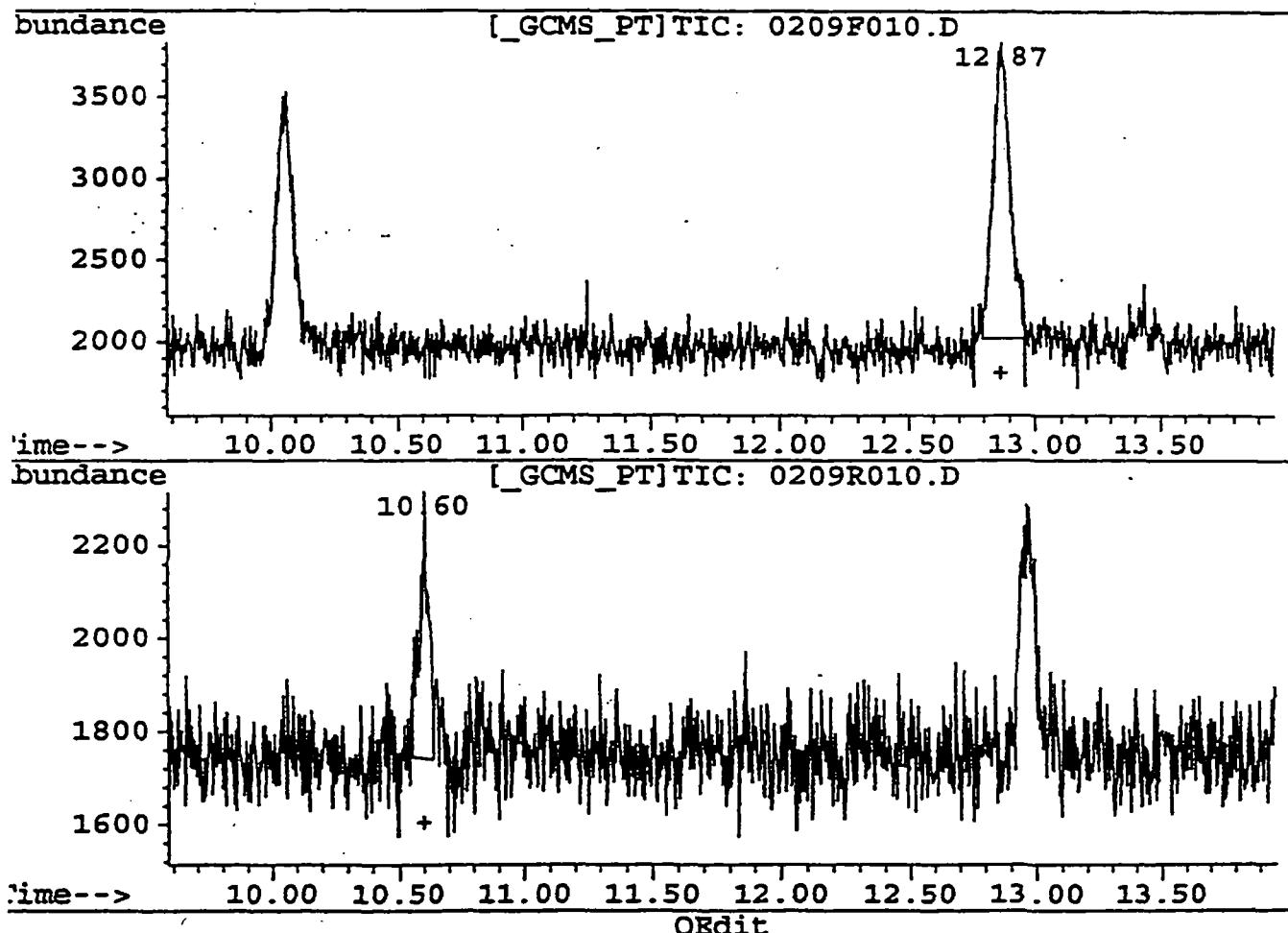
*VN F-11.00*

(3) Tri-n-butyltin #2  
10.60min 3.62ng/ml  
response 589

**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F010.D Vial: 3  
 Signal #2 : J:\GC11\DATA\020900\0209F010.D\0209R010.D  
 Acq On : 09 Feb 00 03:13 PM Operator: lkennedy  
 Sample : OT @ 10ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:51 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:38:49 2000  
 Response via : Multiple Level Calibration



(3) Tri-n-butyltin  
 12.87min 11.86ng/ml  
 response 8444

(3) Tri-n-butyltin #2  
 10.60min 8.67ng/ml m  
 response 1409

*after  
2/10/00  
2/11/00*

(+) = Expected Retention Time  
 0209F010.D 0209TINS.M Thu Feb 10 09:49:55 2000

00076

**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F011.D Vial: 4  
 Signal #2 : J:\GC11\DATA\020900\0209F011.D\0209R011.D  
 Acq On : 09 Feb 00 03:37 PM Operator: lkennedy  
 Sample : OT @ 50ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:52 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
Tri-n-propyltin	9.42	7.72	39826	7660	65.393	57.366
			Recovery	=	13.08%	11.47%
Tri-n-pentyltin	16.56	14.00	34373	6194	66.516	55.386
			Recovery	=	13.30%	11.08%
<b>Target Compounds</b>						
Tetra-n-butyltin	10.04	8.31	35266	5901	62.230	45.203 #
Tri-n-butyltin	12.86	10.59	42528	8358	59.746	51.438
Di-n-butyltin	15.65	12.95	56002	10687	66.395	55.235
n-Butyltin	17.38	15.28	74926	14921	64.104	56.716

KK  
 2-10-00  
 VN 2-11-00

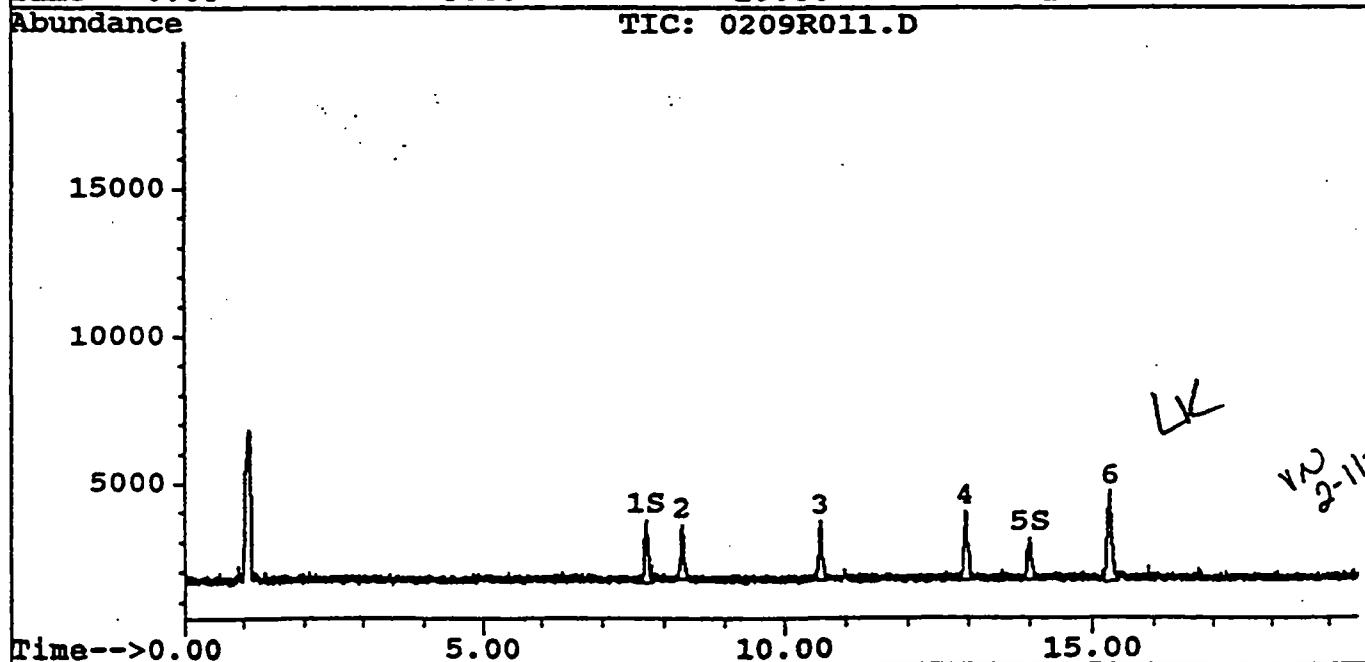
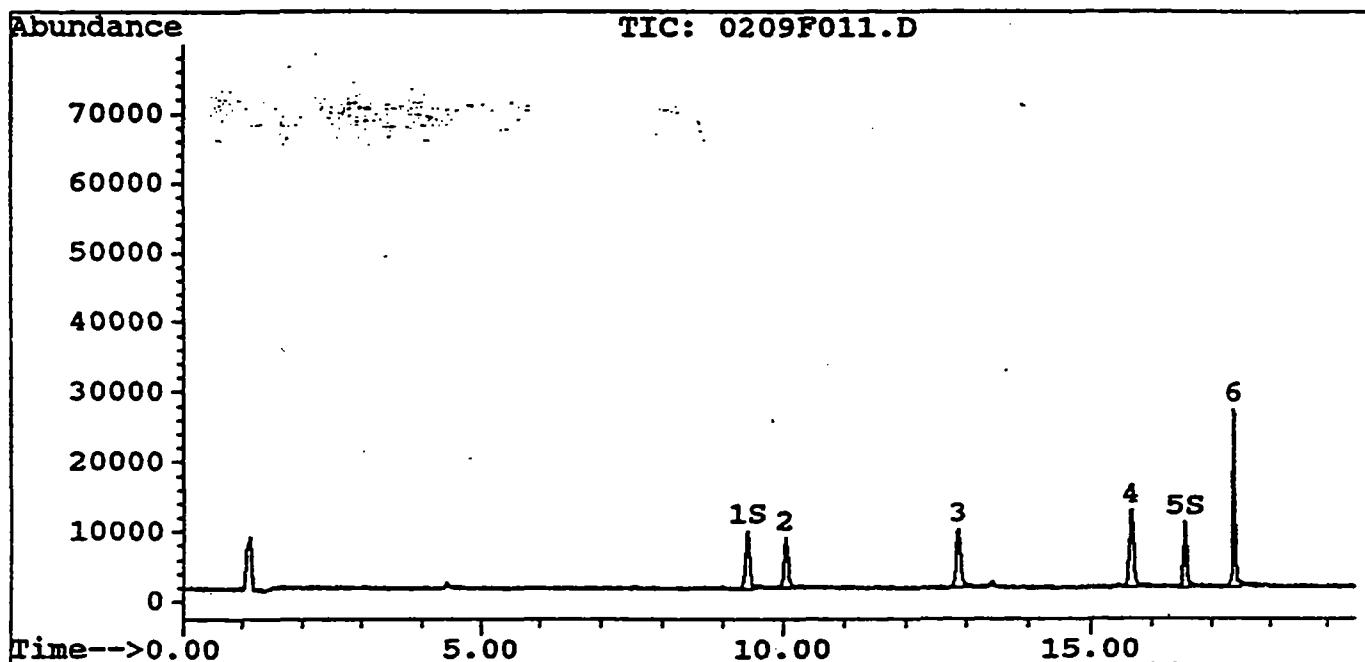
-RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 9F011.D 0209TINS.M Thu Feb 10 09:04:07 2000

# Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F011.D Vial: 4  
 Signal #2 : J:\GC11\DATA\020900\0209F011.D\0209R011.D Operator: lkennedy  
 Acq On : 09 Feb 00 03:37 PM Inst : GC11  
 Sample : OT @ 50ug/L | OT2-73-B Multiplr: 1.00  
 Misc : SVG\qc\K100209\CCV-5S.H |  
 Quant Time: Feb 10 8:52 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F012.D Vial: 5  
 Signal #2 : J:\GC11\DATA\020900\0209F012.D\0209R012.D  
 Acq On : 09 Feb 00 04:01 PM Operator: lkennedy  
 Sample : OT @ 100ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:52 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.41	7.73	76366	12778	125.391	95.696
			Recovery	=	25.08%	19.14%
S Tri-n-pentyltin	16.55	13.97	64211	11935	124.255	106.721
			Recovery	=	24.85%	21.34%
<b>Target Compounds</b>						
Tetra-n-butyltin	10.04	8.31	66806	12624	117.885	96.703
Tri-n-butyltin	12.86	10.59	83605	15859	117.454	97.603
Di-n-butyltin	15.64	12.95	108899	21205	129.108	109.596
n-Butyltin	17.37	15.27	142360	28057	121.799	106.647

*UT*  
*2-10-00*  
*VN 2-11-00*

-RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 0209F012.D 0209TINS.M Thu Feb 10 09:04:38 2000

Page 1

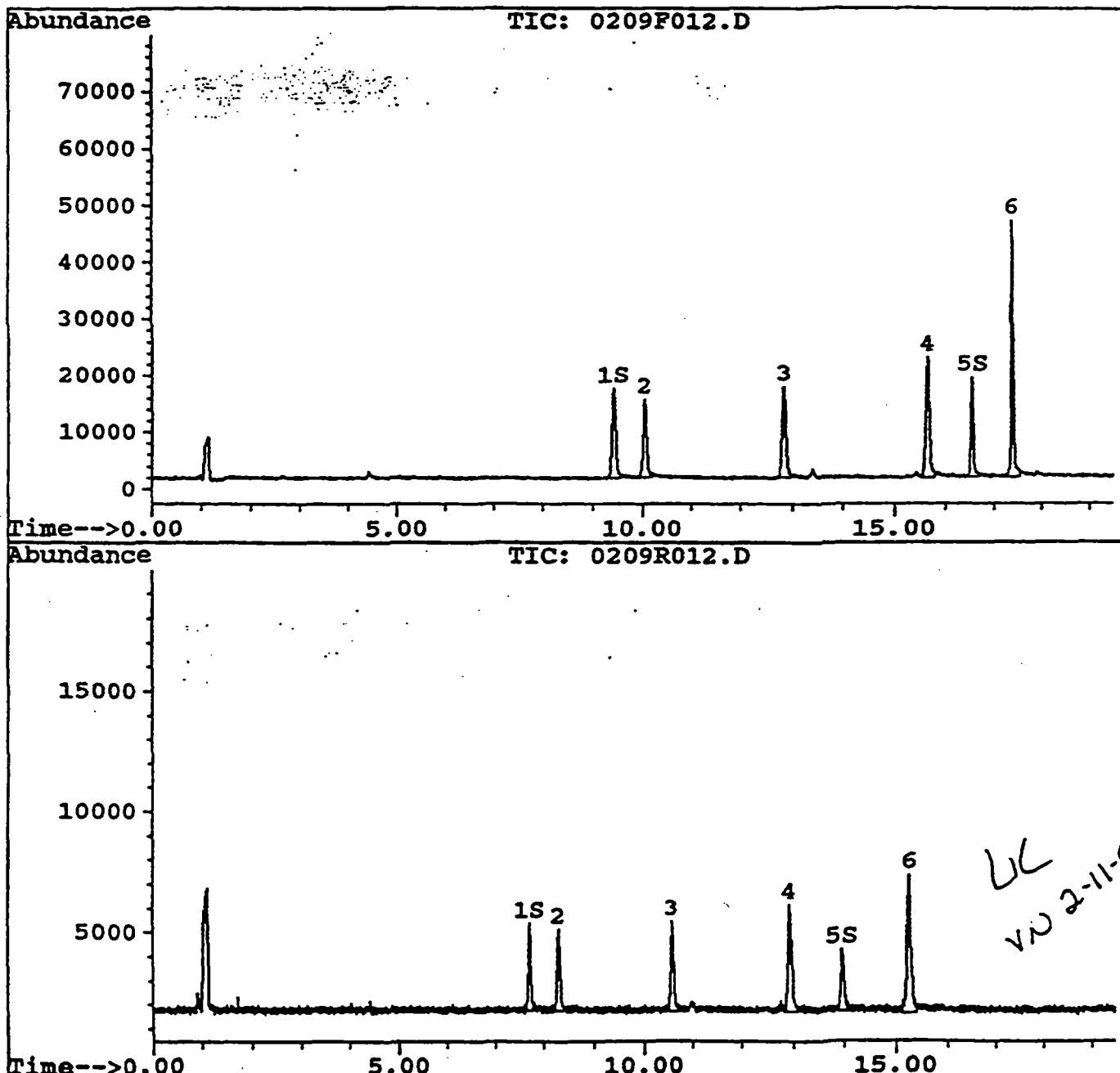
00079

### Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F012.D Vial: 5  
 Signal #2 : J:\GC11\DATA\020900\0209F012.D\0209R012.D  
 Acq On : 09 Feb 00 04:01 PM Operator: lkennedy  
 Sample : OT @ 100ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:52 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F013.D Vial: 6  
 Signal #2 : J:\GC11\DATA\020900\0209F013.D\0209R013.D  
 Acq On : 09 Feb 00 04:24 PM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:53 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
S Tri-n-propyltin	9.42	7.73	387651	70648	636.511	529.089
			Recovery	=	127.30%	105.82%
S Tri-n-pentyltin	16.56	14.00	305746	59277	591.652	530.044
			Recovery	=	118.33%	106.01%
<b>Target Compounds</b>						
Tetra-n-butyltin	10.06	8.32	332090	63695	586.004	487.918 <sup>TV</sup> 490
Tri-n-butyltin	12.87	10.60	425094	80749	597.202	496.962 <sup>TV</sup> 475
Di-n-butyltin	15.65	12.97	526359	103243	624.040	533.602 <sup>TV</sup> 510
n-Butyltin	17.38	15.29	704033	140974	602.348	535.856 <sup>TV</sup> 490

ICP

4/210-00  
VN 2-11-00

(\*)=RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
0209F013.D 0209TINS.M Thu Feb 10 09:05:09 2000

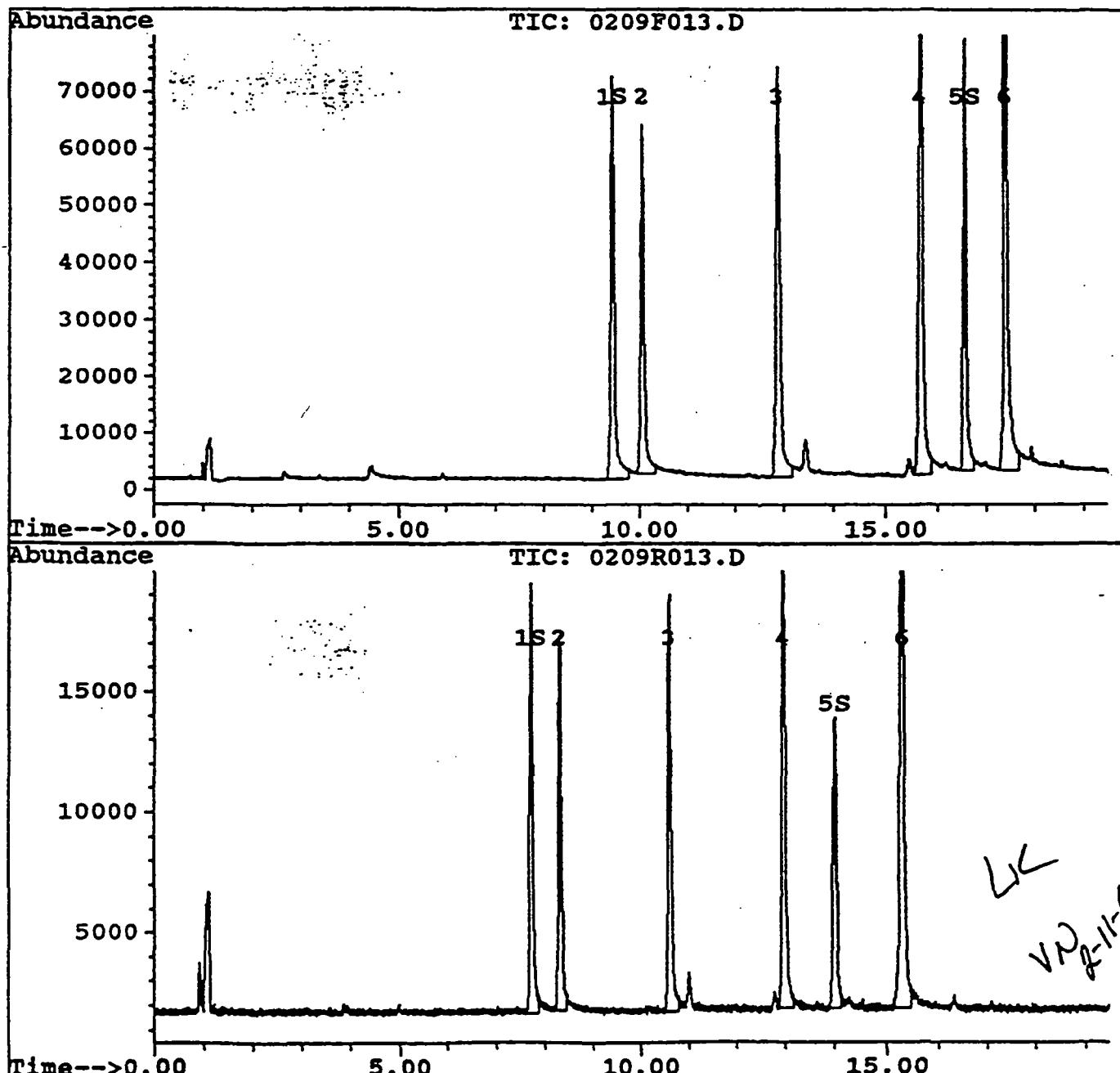
Page 1  
00081

### Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F013.D vial: 6  
Signal #2 : J:\GC11\DATA\020900\0209F013.D\0209R013.D  
Acq On : 09 Feb 00 04:24 PM Operator: lkennedy  
Sample : OT @ 500ug/L | OT2-73-B Inst : GC11  
Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
Quant Time: Feb 10 8:53 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 09:02:28 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F014.D Vial: 7  
 Signal #2 : J:\GC11\DATA\020900\0209F014.D\0209R014.D  
 Acq On : 09 Feb 00 04:48 PM Operator: lkennedy  
 Sample : OT @ 1000ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:53 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
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**System Monitoring Compounds**

Tri-n-propyltin	9.41	7.71	719962	142243	1182.155	1065.270
			Recovery	=	236.43%	213.05%
Tri-n-pentyltin	16.55	13.98	607535	123003	1175.647	1099.870
			Recovery	=	235.13%	219.97%

**Target Compounds**

Tetra-n-butyltin	10.04	8.30	633230	126121	1117.394	966.116
Tri-n-butyltin	12.85	10.59	810930	164720	1139.251	1013.753
Di-n-butyltin	15.64	12.95	1028837	202682	1219.767	1047.542
n-Butyltin	17.38	15.27	1330491	278694	1138.325	1059.343

*UT*  
*2-10-00*  
*VN 211-00*

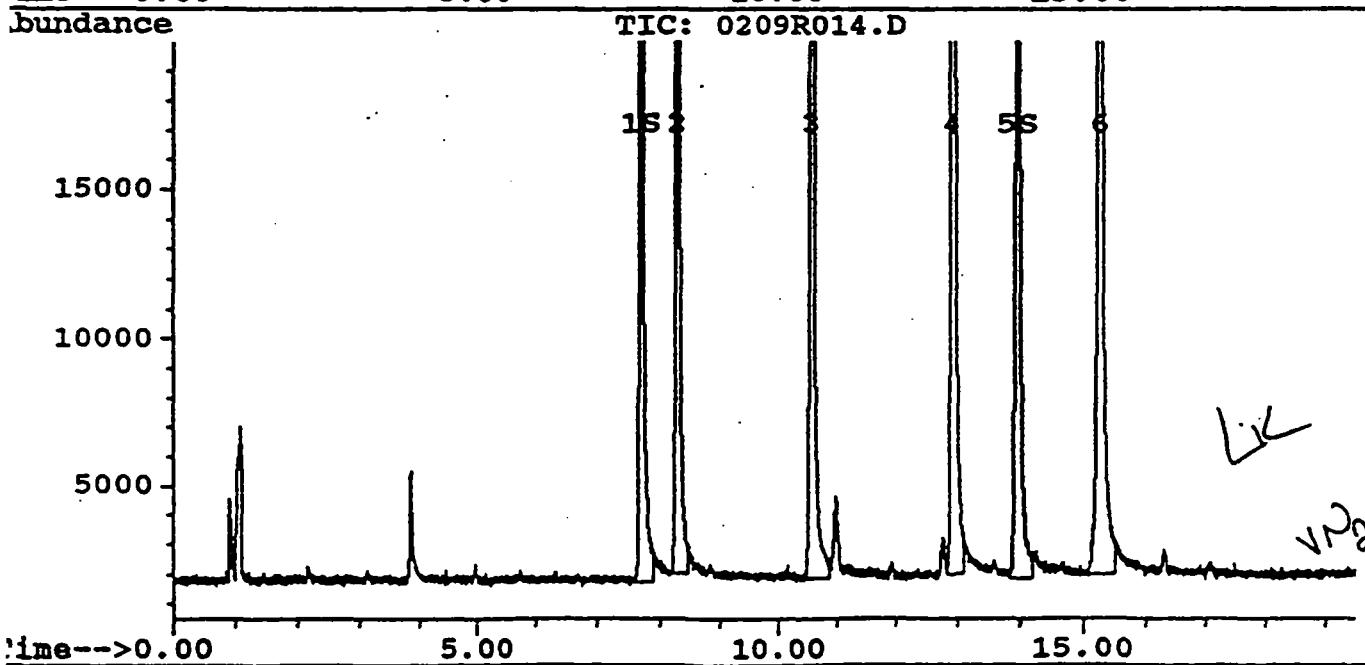
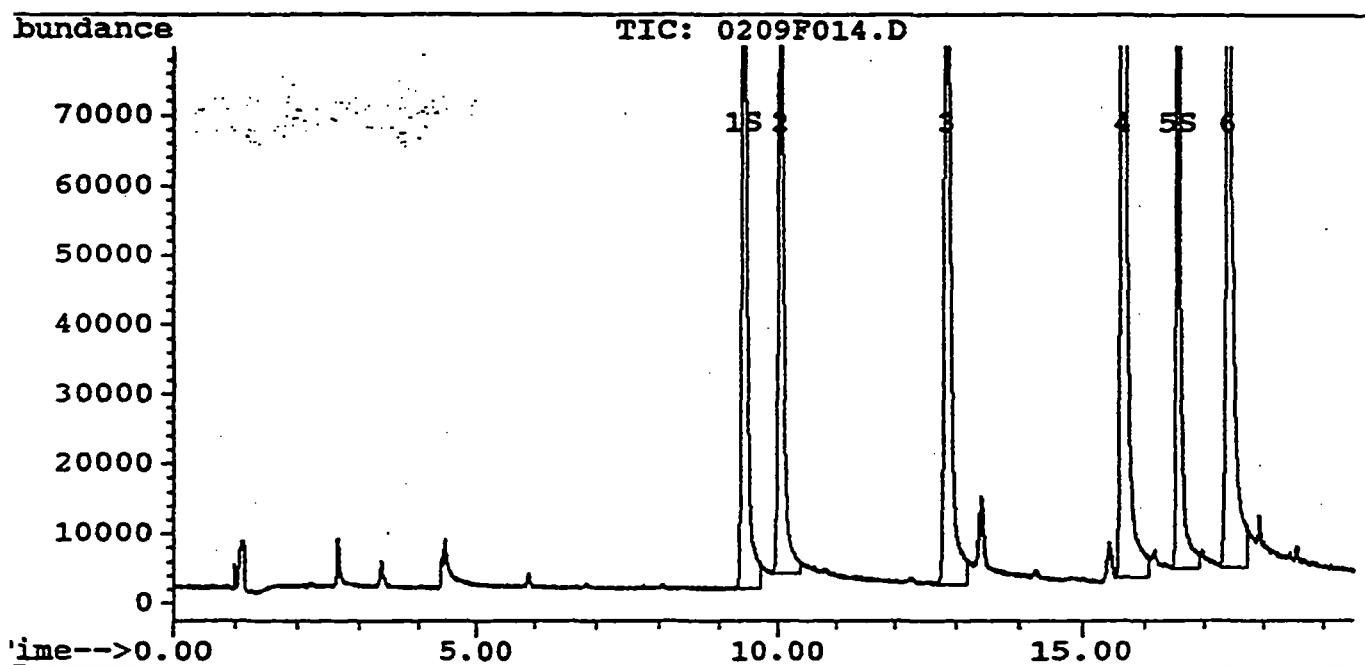
-RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 0209F014.D 0209TINS.M Thu Feb 10 09:05:41 2000

**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F014.D Vial: 7  
 Signal #2 : J:\GC11\DATA\020900\0209F014.D\0209R014.D  
 Accq On : 09 Feb 00 04:48 PM Operator: lkennedy  
 Sample : OT @ 1000ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:53 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F015.D Vial: 8  
 Signal #2 : J:\GC11\DATA\020900\0209F015.D\0209R015.D  
 Acq On : 09 Feb 00 05:12 PM Operator: lkennedy  
 Sample : OT @ 2000ug/L | OT2-73-B Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 8:54 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 09:02:28 2000  
 Response via : Multiple Level Calibration

Volume Inj. :  
 Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
Tri-n-propyltin	9.41	7.72	1406002	289102	2308.611	2165.109
			Recovery	=	461.72%	433.02%
Tri-n-pentyltin	16.54	13.98	1155352	240326	2235.734	2148.950
			Recovery	=	447.15%	429.79%
<b>Target Compounds</b>						
Tetra-n-butyltin	10.04	8.30	1264467	258002	2231.271	1976.355
Tri-n-butyltin	12.85	10.58	1583687	327222	2224.874	2013.855
Di-n-butyltin	15.63	12.95	1964174	412574	2328.682	2132.349
n-Butyltin	17.37	15.25	2585778	559802	2212.308	2127.862

LL  
2-10-00  
JN 2-11-00

RT Delta > 1/2 Window (#)=Amounts differ by > 25% (m)=manual int.  
 F015.D 0209TINS.M Thu Feb 10 09:06:12 2000

Page 1

00085 :

# Quantitation Report

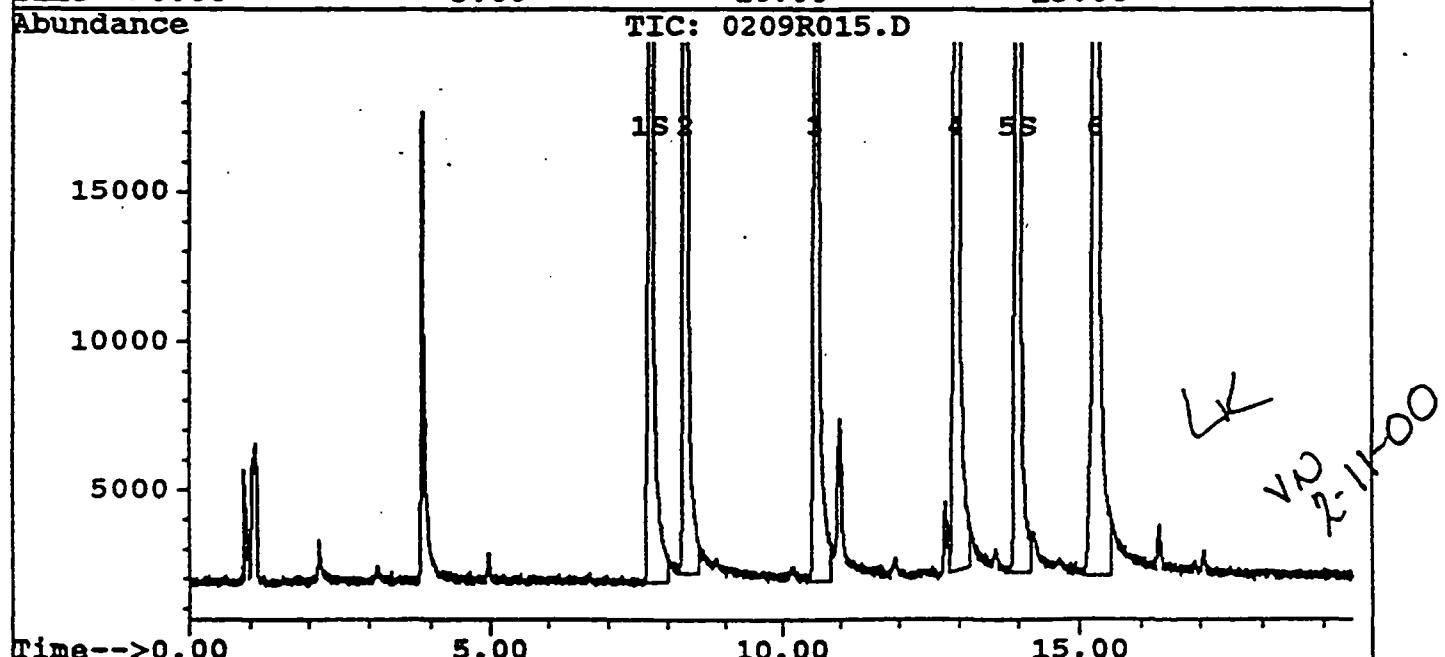
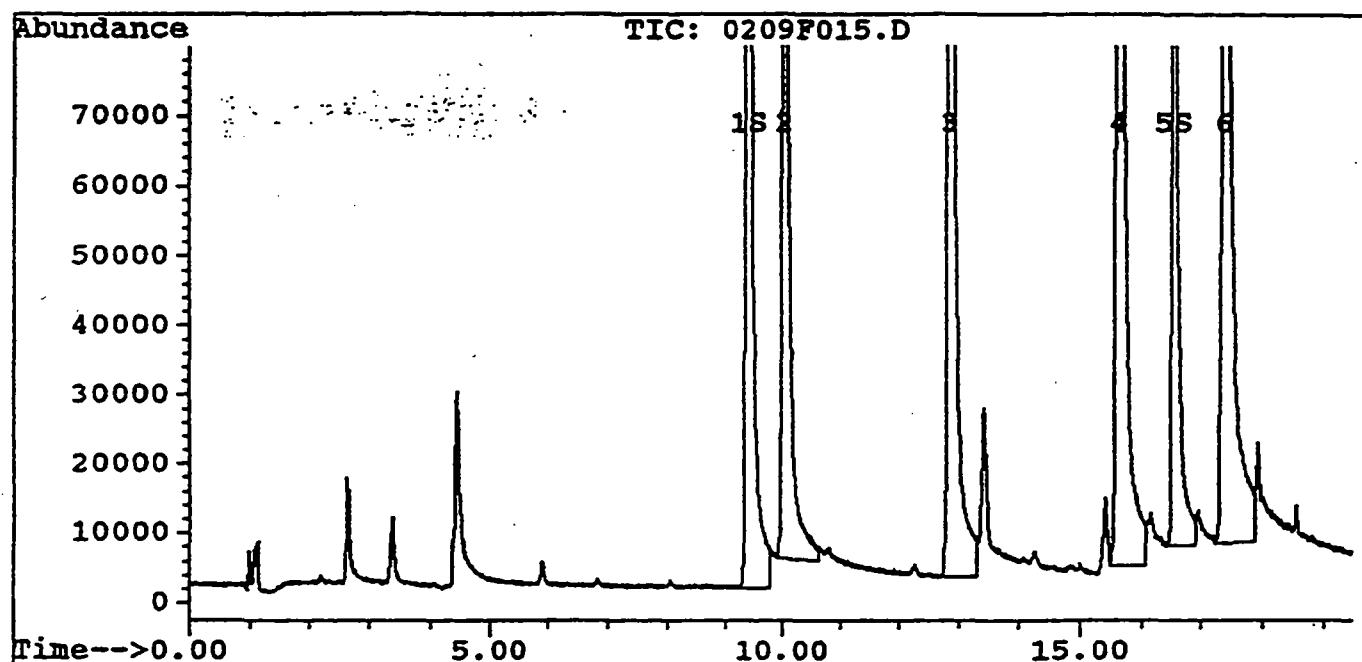
Signal #1 : J:\GC11\DATA\020900\0209F015.D Vial: 8  
Signal #2 : J:\GC11\DATA\020900\0209F015.D\0209R015.D  
Acq On : 09 Feb 00 05:12 PM Operator: lkennedy  
Sample : OT @ 2000ug/L | OT2-73-B Inst : GC11  
Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
Quant Time: Feb 10 8:54 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 09:02:28 2000  
Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50  
Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200  
Signal #2 Info : 0.53mm id.



# Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F016.D Vial: 2  
 Signal #2 : J:\GC11\DATA\020900\0209F016.D\0209R016.D  
 Acq On : 09 Feb 00 05:36 PM Operator: lkennedy  
 Sample : K000209-IB-DN Inst : GC11  
 Misc : SVG\qc\K100209\IB-DN.H | F=1 D=100 A=19. Multiplr: 1.00  
 Quant Time: Feb 10 10:00 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 10:06:13 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
 Signal #1 Info : 0.53mm id. Signal #2 Info : 0.53mm id.

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
<b>System Monitoring Compounds</b>						
Tri-n-propyltin	9.37f	0.00	664	0	0.871	N.D. #
			Recovery	=	0.17%	0.00%
<b>Target Compounds</b>						
Tetra-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
Tri-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
Di-n-butyltin	0.00	0.00	0	0	N.D.	N.D.
n-Butyltin	0.00	0.00	0	0	N.D.	N.D.

*LF*  
*2-10-00*  
*VJ 2-11-00*

# Quantitation Report

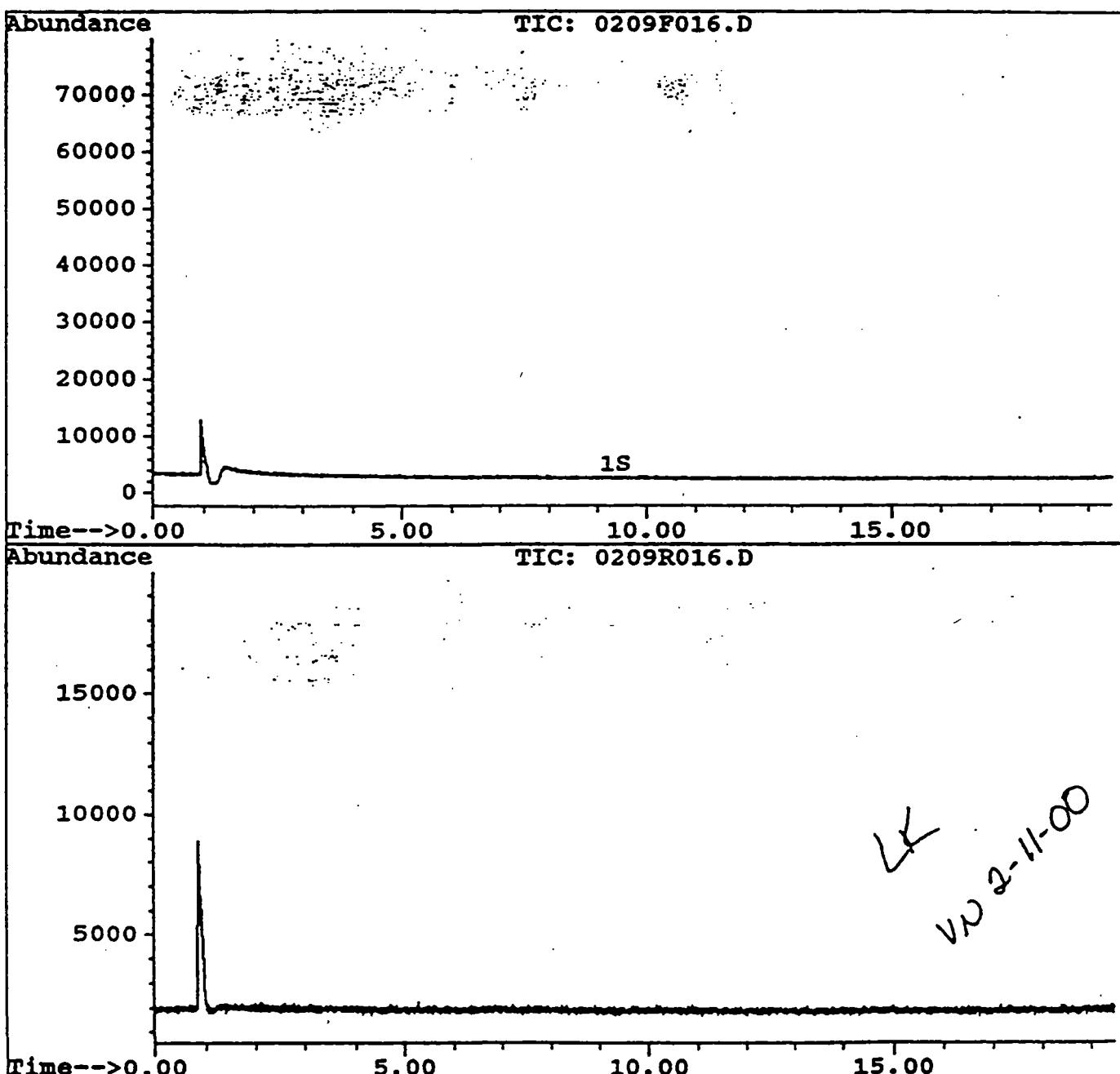
Signal #1 : J:\GC11\DATA\020900\0209F016.D Vial: 2  
Signal #2 : J:\GC11\DATA\020900\0209F016.D\0209R016.D  
Acq On : 09 Feb 00 05:36 PM Operator: lkennedy  
Sample : K000209-IB-DN Inst : GC11  
Misc : SVG\qc\K100209\IB-DN.H | F=1 D=100 A=19. Multiplr: 1.00  
Quant Time: Feb 10 10:00 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 10:06:13 2000  
Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50  
Signal #1 Info : 0.53mm id.

Signal #2 Phase: RTX-200  
Signal #2 Info : 0.53mm id.



**Quantitation Report**

Signal #1 : J:\GC11\DATA\020900\0209F017.D Vial: 9  
 Signal #2 : J:\GC11\DATA\020900\0209F017.D\0209R017.D  
 Acq On : 09 Feb 00 06:00 PM Operator: lkennedy  
 Sample : OT @ 500ug/L | OT2-68-E Inst : GC11  
 Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
 Quant Time: Feb 10 10:00 19100

Method : J:\GC11\METHODS\0209TINS.M  
 Title : Butyltins by GC-FPD  
 Last Update : Thu Feb 10 10:06:13 2000  
 Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50  
Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200  
Signal #2 Info : 0.53mm id.

*T<sub>V</sub>* = 500  $\mu$ g/L as Salt

Compound	RT#1	RT#2	Resp#1	Resp#2	ng/ml	ng/ml
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**System Monitoring Compounds**

Tri-n-propyltin	0.00	0.00	0	0	N.D.	N.D.
Tri-n-pentyltin	16.63f	0.00	Recovery 4607	= 0	0.00%	0.00%
			Recovery	=	7.223	N.D. #
					1.44%	0.00%

**Target Compounds *T<sub>V</sub> as Color***

Tetra-n-butyltin	500	10.05	8.31	287853	56487	411.9478% 467.9589%
Tri-n-butyltin	445	12.85	10.59	350355	68212	400.689% 406.5009%
Di-n-butyltin	383	15.63	12.96	384229	73999	360.316% 343.9089%
n-Butyltin	311	17.37	15.25	361709	73287	246.858% 237.933-T%

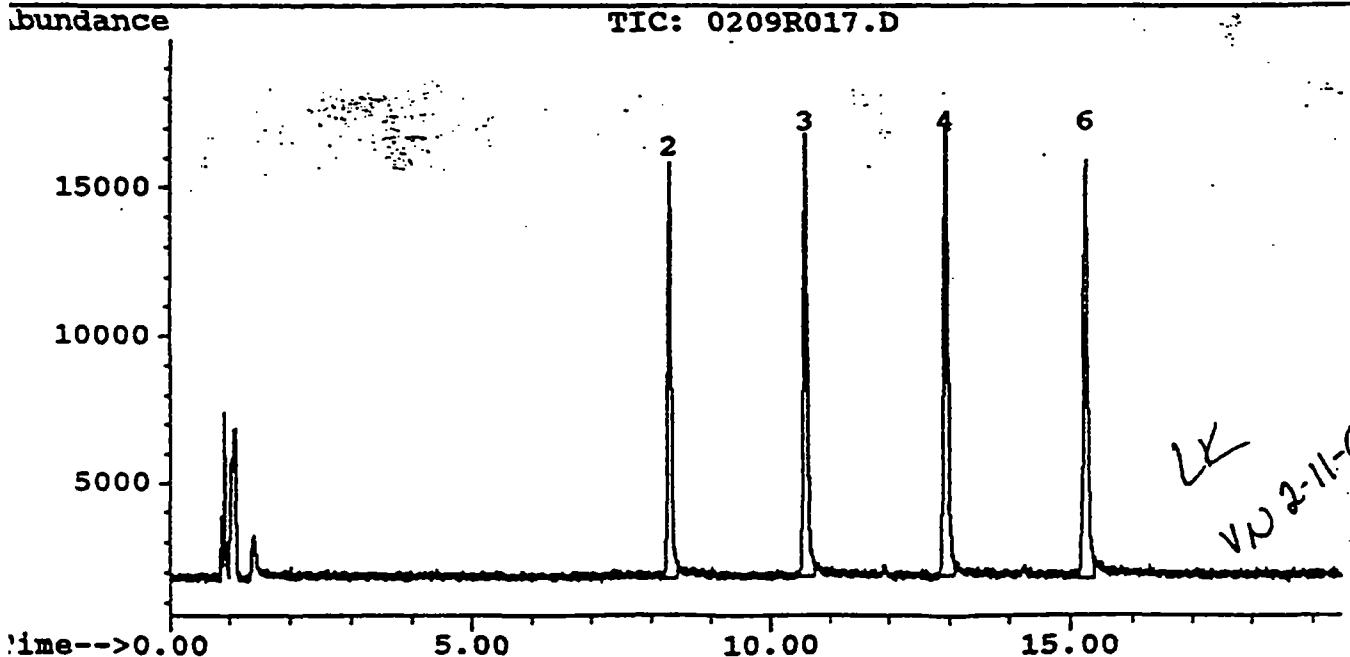
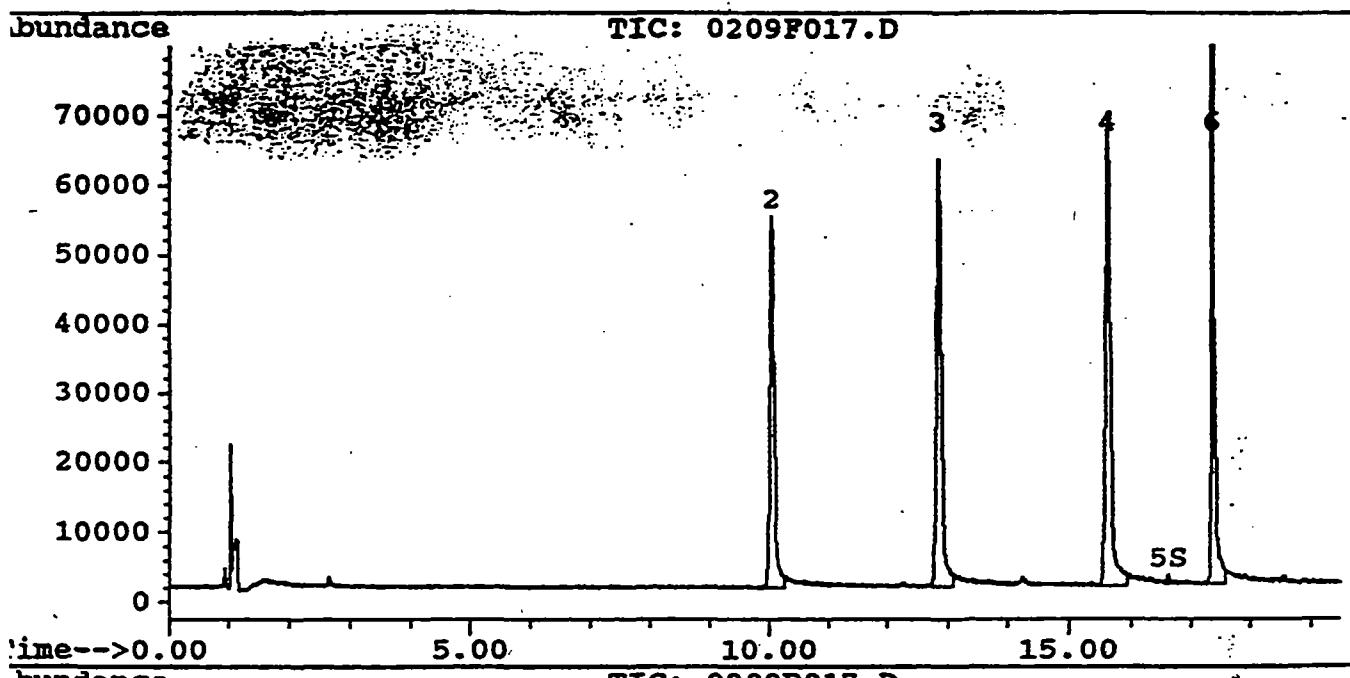
*UK  
2-10-00  
VN 2-11-00*

# Quantitation Report

Signal #1 : J:\GC11\DATA\020900\0209F017.D Vial: 9  
Signal #2 : J:\GC11\DATA\020900\0209F017.D\0209R017.D  
Acq On : 09 Feb 00 06:00 PM Operator: lkennedy  
Sample : OT @ 500ug/L | OT2-68-E Inst : GC11  
Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
Quant Time: Feb 10 10:00 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 10:06:13 2000  
Response via : Multiple Level Calibration

Volume Inj. :  
Signal #1 Phase : RTX-50 Signal #2 Phase: RTX-200  
Signal #1 Info : 0.53mm id Signal #2 Info : 0.53mm id.



### Quantitation Report

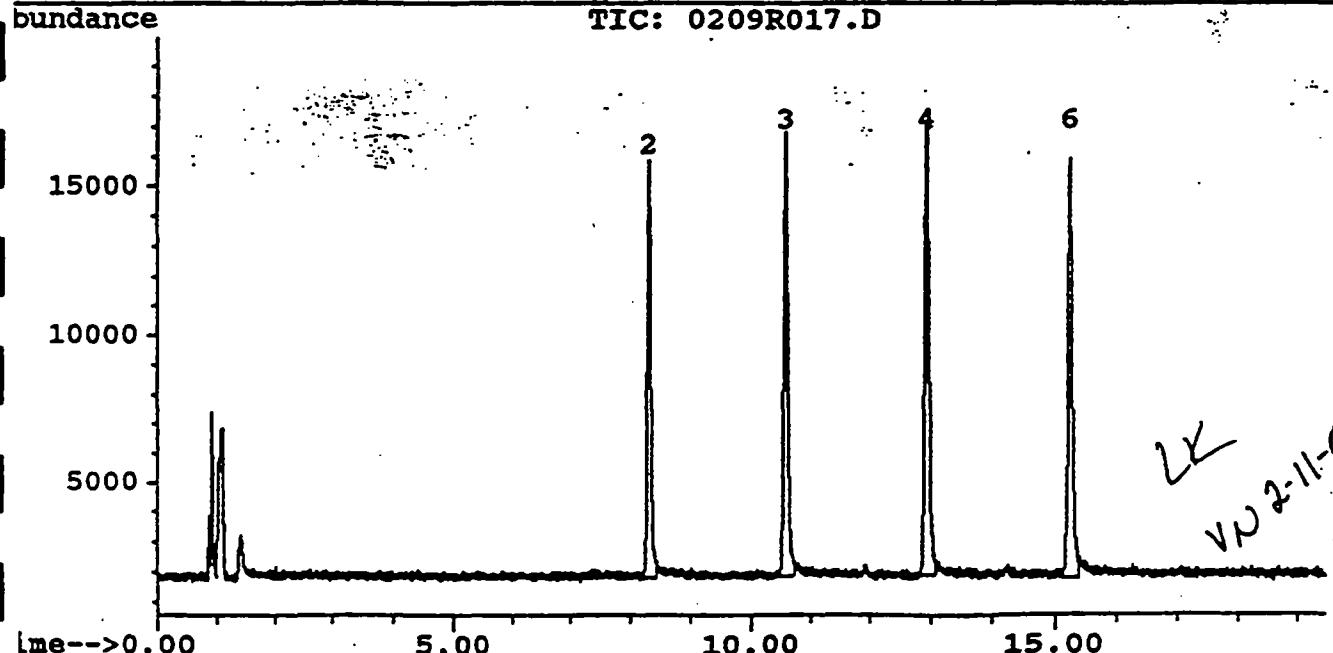
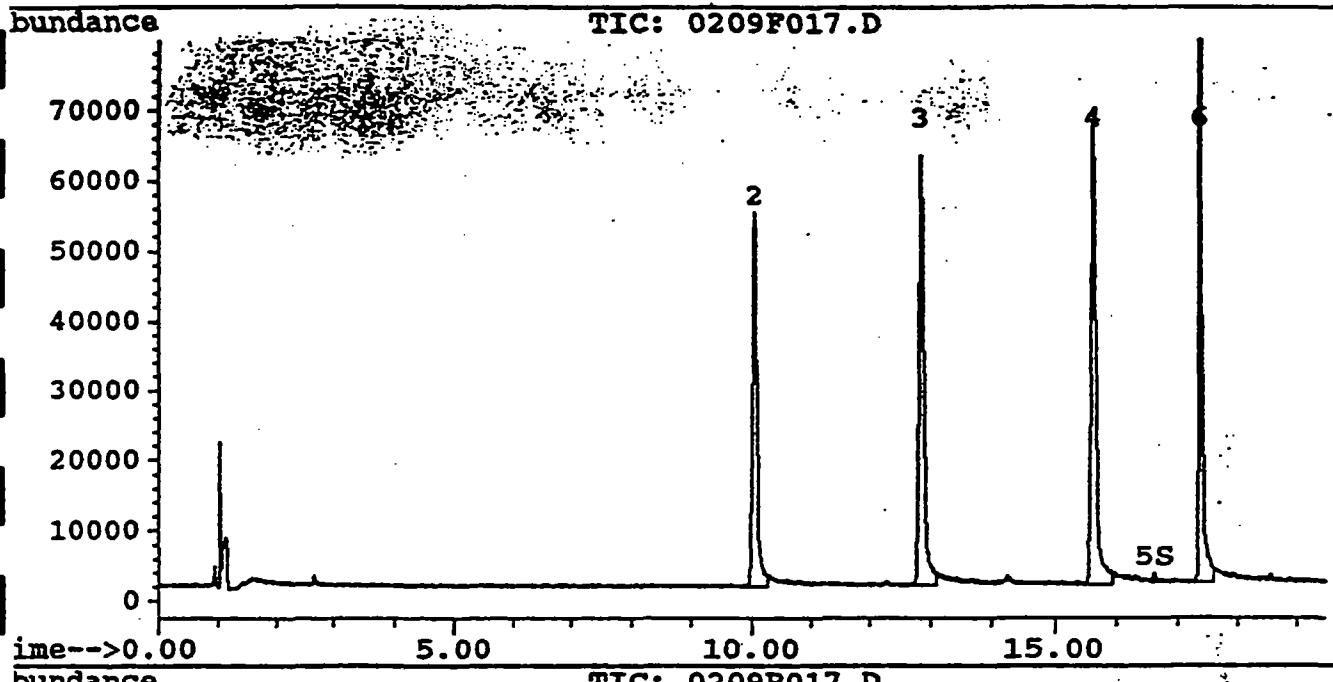
Signal #1 : J:\GC11\DATA\020900\0209F017.D vial: 9  
Signal #2 : J:\GC11\DATA\020900\0209F017.D\0209R017.D  
Acq On : 09 Feb 00 06:00 PM Operator: lkennedy  
Sample : OT @ 500ug/L | OT2-68-E Inst : GC11  
Misc : SVG\qc\K100209\CCV-5S.H | Multiplr: 1.00  
Quant Time: Feb 10 10:00 19100

Method : J:\GC11\METHODS\0209TINS.M  
Title : Butyltins by GC-FPD  
Last Update : Thu Feb 10 10:06:13 2000  
Response via : Multiple Level Calibration

Volume Inj. :

Signal #1 Phase : RTX-50  
Signal #1 Info : 0.53mm id

Signal #2 Phase: RTX-200  
Signal #2 Info : 0.53mm id.



## **GRAIN SIZE DISTRIBUTION CURVES**

# COMBINED SIEVE & PIPET ANALYSES

Job Name:	Port of Portland Terminal 5	Start Date:	12/1/1999		
Job Number:	J-5930	End Date:	12/9/1999		
Exploration Number:	HC-B501	Tested By:	GWK		
Sample Number:	Barge-C1	Checked By:			
Depth:		Fig. Number:			
Sample Matrix:	Sediment				
Classification	Description:	Fine to medium SAND			
	Gravel:	0%	Pipet Sample	Tare ID:	G10
	Sand:	98%		Wt. Tare:	204.1700
	Silt:	1%		Wt. Wet + Tare:	370.5700
	Clay:	1%		Wt. Dry + Tare:	341.1800
			Moist. Content:	21.5%	

Density of Dispersant: 0.00013 g/ml

Amount Retained on #230: 134.6700 g

Amount of Dispersant: 10 ml

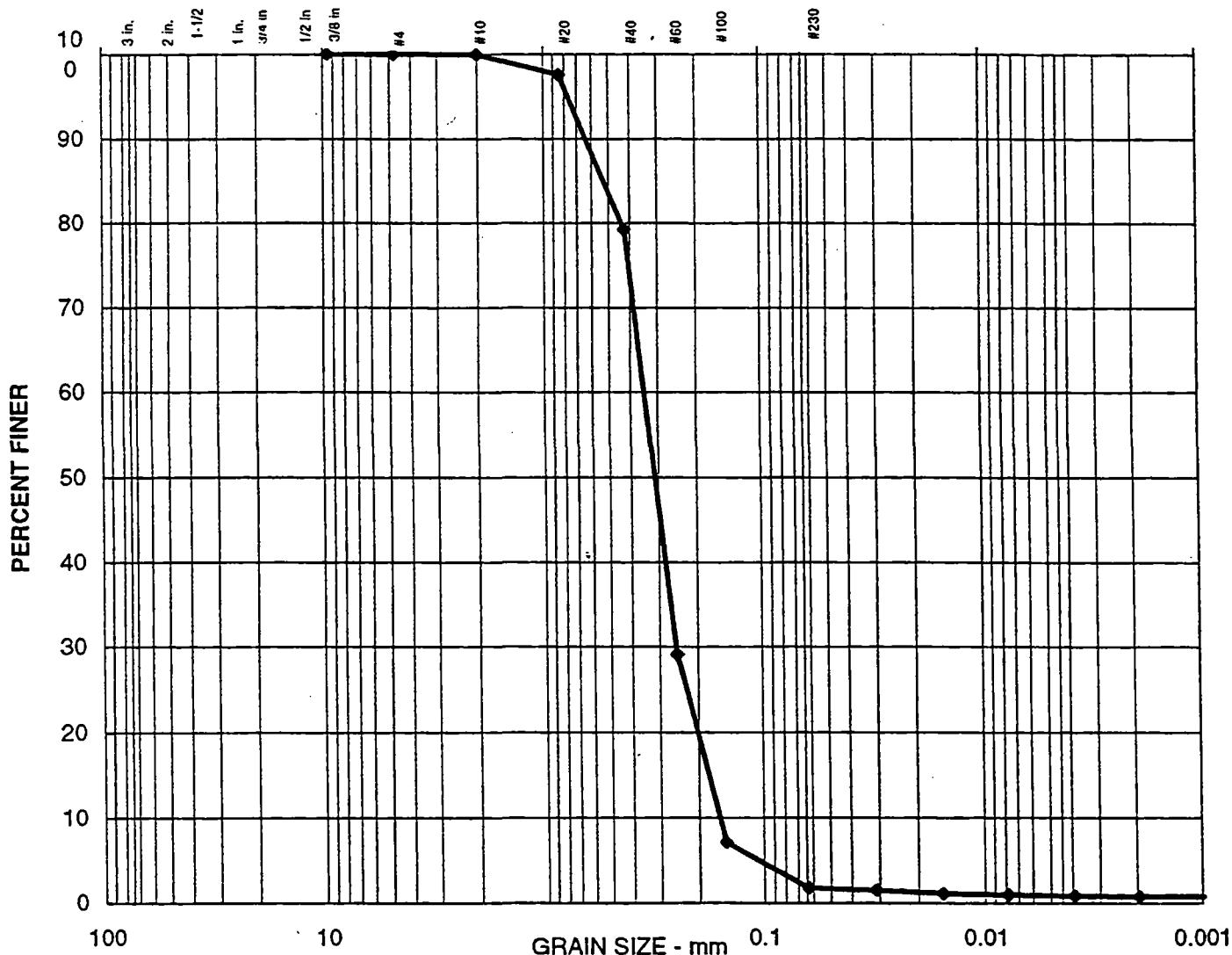
Total Dry Weight: 137.0100 g

Particle Size (mm)	Sieve Size/ Pipet Time Reading	Cumulative Wt Tare & soil	Tare Wt	Dispersant Dry Wt	Pipet Sample Dry Wt	Accumulative Wt Retained	Percent Passing
19	3/4"			-	-		
12.5	1/2"			-	-		
9.5	3/8"			-	-	0.0000	100.0
4.75	#4			-	-	0.0000	100.0
2	#10	0.0600	0.0000	-	-	0.0600	100.0
0.85	#20	3.3600	0.0000	-	-	3.3600	97.5
0.425	#40	28.5000	0.0000	-	-	28.5000	79.2
0.25	#60	97.1700	0.0000	-	-	97.1700	29.1
0.15	#100	127.2600	0.0000	-	-	127.2600	7.1
0.063	#230	134.6700	0.0000	-	-	134.6700	1.7
0.063	20s *	39.7868	39.7573	0.0013	1.4750	-	1.7
0.0312	1m 54s	30.0077	29.9855	0.0013	1.1100	135.0350	1.4
0.0156	7m 36s	35.6464	35.6342	0.0013	0.6100	135.5350	1.1
0.0078	30m 26s	35.9813	35.9736	0.0013	0.3850	135.7600	0.9
0.0039	122m	37.9274	37.9228	0.0013	0.2300	135.9150	0.8
0.00195	8h 6m	28.8639	28.8605	0.0013	0.1700	135.9750	0.8
0.00098	32h 28m	29.1285	29.1258	0.0013	0.1350	136.0100	0.7

Note: All measurements in grams unless otherwise noted.

\* beginning of pipet time reading, the weight in the next column is not cumulative starting from this reading down

# SIEVE & PIPET ANALYSES TEST REPORT



Exploration Number:	Sample Number:	Sample Depth	Sample Matrix:	Natural Moisture:
HC-B501	Barge-C1	*	Sediment	21.5%

## MATERIAL DESCRIPTION

Fine to medium SAND

Remarks:	Project: Port of Portland Terminal 5
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J-5930

# COMBINED SIEVE & PIPET ANALYSES

Job Name:	Port of Portland Terminal 5	Start Date:	12/1/1999
Job Number:	J-5930	End Date:	12/9/1999
Exploration Number:	HC-B501	Tested By:	GWK
Sample Number:	C1	Checked By:	
Depth:		Fig. Number:	
Sample Matrix:	Sediment		
Classification	Description: Fine to medium SAND	Pipet Sample	Tare ID: G16
	Gravel: 0%		Wt. Tare: 206.8900
	Sand: 98%		Wt. Wet + Tare: 356.2600
	Silt: 1%		Wt. Dry + Tare: 321.7700
	Clay: 1%		Moist. Content: 30.0%

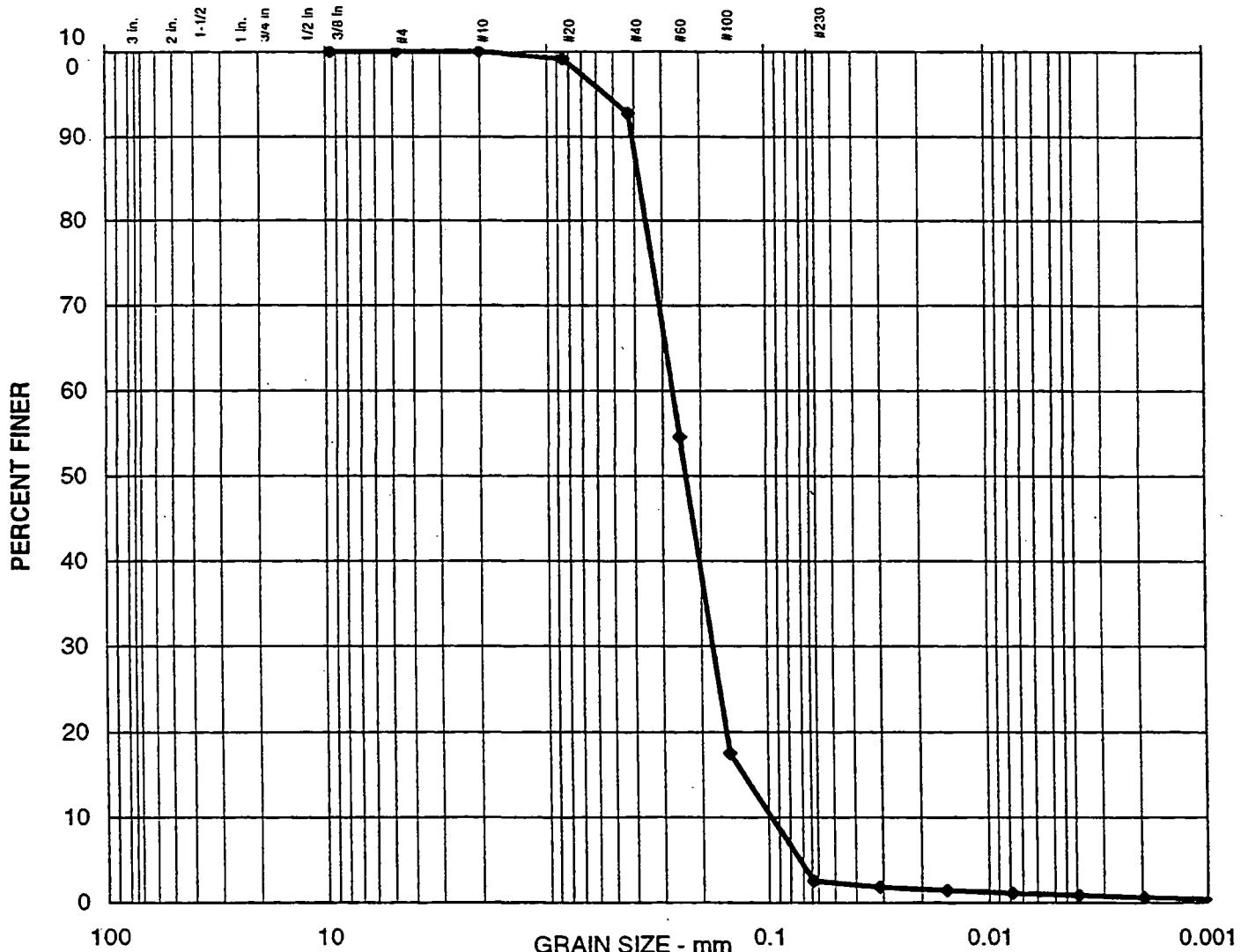
Density of Dispersant: 0.00013 g/ml      Amount Retained on #230: 112.0200 g  
 Amount of Dispersant: 20 ml      Total Dry Weight: 114.8800 g

Particle Size (mm)	Sieve Size/ Pipet Time Reading	Cumulative Wt Tare & soil	Tare Wt	Dispersant Dry Wt	Pipet Sample Dry Wt	Accumulative Wt Retained	Percent Passing
19	3/4"			-	-		
12.5	1/2"			-	-		
9.5	3/8"			-	-	0.0000	100.0
4.75	#4			-	-	0.0000	100.0
2	#10	0.0180	0.0000	-	-	0.0180	100.0
0.85	#20	0.9700	0.0000	-	-	0.9700	99.2
0.425	#40	8.4400	0.0000	-	-	8.4400	92.7
0.25	#60	52.1700	0.0000	-	-	52.1700	54.6
0.15	#100	94.8200	0.0000	-	-	94.8200	17.5
0.063	#230	112.0200	0.0000	-	-	112.0200	2.5
0.063	20s *	28.7678	28.7158	0.0026	2.6000	-	2.5
0.0312	1m 54s	29.3672	29.3310	0.0026	1.8100	112.8100	1.8
0.0156	7m 36s	34.7518	34.7252	0.0026	1.3300	113.2900	1.4
0.0078	30m 26s	29.8180	29.7987	0.0026	0.9650	113.6550	1.1
0.0039	122m	34.5060	34.4927	0.0026	0.6650	113.9550	0.8
0.00195	8h 6m	35.6713	35.6642	0.0026	0.3550	114.2650	0.5
0.00098	32h 28m	34.9659	34.9631	0.0026	0.1400	114.4800	0.3

Note: All measurements in grams unless otherwise noted.

\* beginning of pipet time reading, the weight in the next column is not cumulative starting from this reading down

# SIEVE & PIPET ANALYSES TEST REPORT



% +75mm	% GRAVEL	% SAND	% SILT	% CLAY
	0%	98%	1%	1%

Exploration Number:	Sample Number:	Sample Depth	Sample Matrix:	Natural Moisture:
HC-B501	C1	*	Sediment	30.0%

## MATERIAL DESCRIPTION

Fine to medium SAND

Remarks:	Project: Port of Portland Terminal 5
	 <b>HARTCROWSER</b>

# COMBINED SIEVE & PIPET ANALYSES

Job Name:	Port of Portland Terminal 5		Start Date:	12/1/1999
Job Number:	J-5930		End Date:	12/9/1999
Exploration Number:	HC-B503		Tested By:	GWK
Sample Number:	C1		Checked By:	
Depth:			Fig. Number:	
Sample Matrix:	Sediment			
Classification	Description:	Very sandy SILT		
	Gravel:	0%	Pipet Sample	Tare ID: G15
	Sand:	32%		Wt. Tare: 1.5800
	Silt:	58%		Wt. Wet + Tare: 34.9500
	Clay:	10%		Wt. Dry + Tare: 21.0800
				Moist. Content: 71.1%

Density of Dispersant: 0.00013 g/ml

Amount Retained on #230: 6.1500 g

Amount of Dispersant: 20 ml

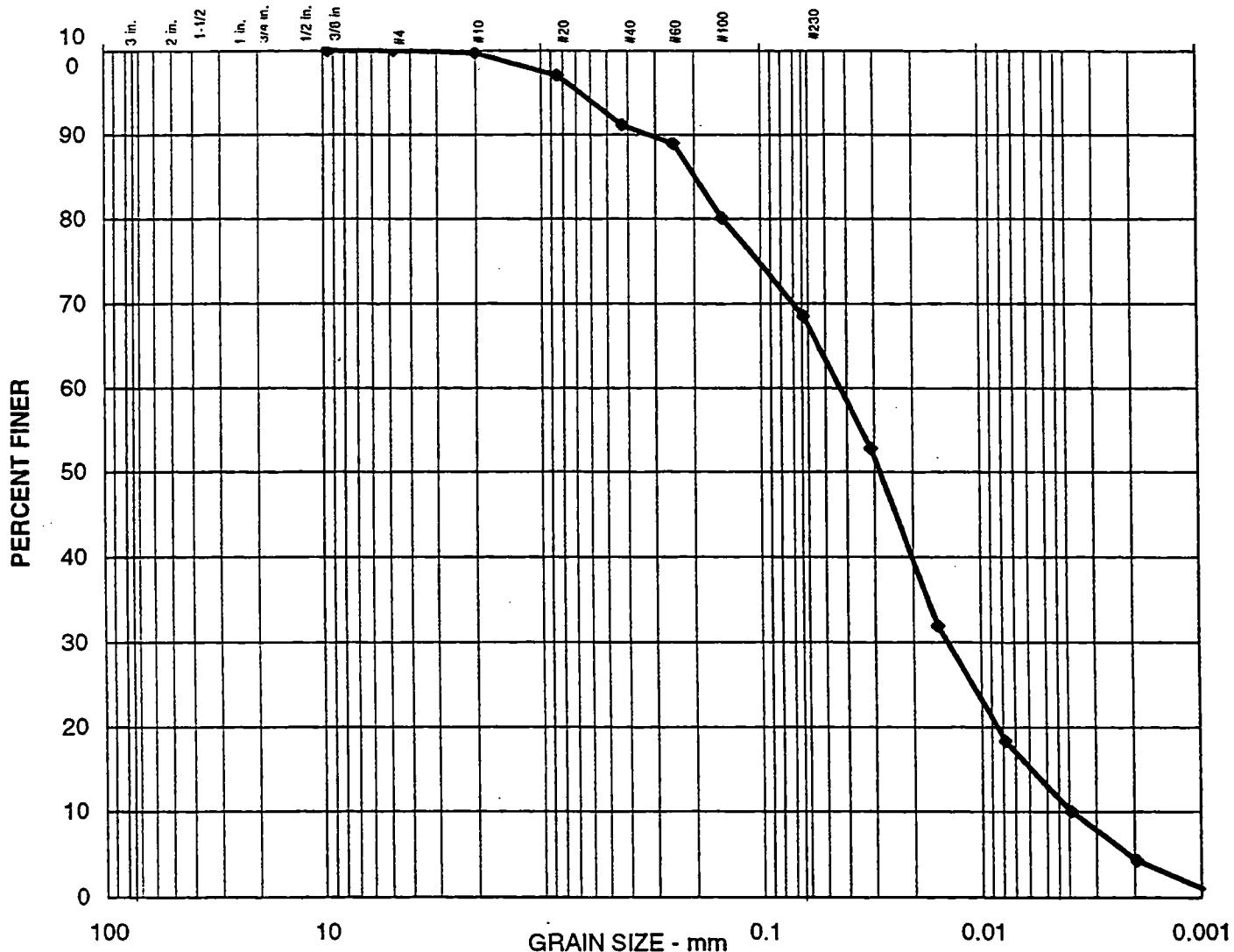
Total Dry Weight: 19.5000 g

Particle Size (mm)	Sieve Size/ Pipet Time Reading	Cumulative Wt Tare & soil	Tare Wt.	Dispersant Dry Wt	Pipet Sample Dry Wt.	Accumulative Wt. Retained	Percent Passing
19	3/4"			-	-		
12.5	1/2"			-	-		
9.5	3/8"			-	-	0.0000	100.0
4.75	#4			-	-	0.0000	100.0
2	#10	0.0500	0.0000	-	-	0.0500	99.7
0.85	#20	0.5800	0.0000	-	-	0.5800	97.0
0.425	#40	1.7300	0.0000	-	-	1.7300	91.1
0.25	#60	2.1600	0.0000	-	-	2.1600	88.9
0.15	#100	3.8800	0.0000	-	-	3.8800	80.1
0.063	#230	6.1500	0.0000	-	-	6.1500	68.5
0.063	20s *	35.1874	34.9062	0.0026	14.0600	-	68.5
0.0312	1m 54s	30.8242	30.6042	0.0026	11.0000	9.2100	52.8
0.0156	7m 36s	37.0584	36.9197	0.0026	6.9350	13.2750	31.9
0.0078	30m 26s	29.2663	29.1806	0.0026	4.2850	15.9250	18.3
0.0039	122m	40.1676	40.1142	0.0026	2.6700	17.5400	10.1
0.00195	8h 6m	34.0192	33.9883	0.0026	1.5450	18.6650	4.3
0.00098	32h 28m	36.9448	36.9267	0.0026	0.9050	19.3050	1.0

Note: All measurements in grams unless otherwise noted.

\* beginning of pipet time reading, the weight in the next column is not cumulative starting from this reading down

# SIEVE & PIPET ANALYSES TEST REPORT



% +75mm	% GRAVEL	% SAND	% SILT	% CLAY
	0%	32%	58%	10%

Exploration Number:	Sample Number:	Sample Depth	Sample Matrix:	Natural Moisture:
HC-B503	C1	*	Sediment	71.1%

## MATERIAL DESCRIPTION

Very sandy SILT

Remarks:	Project: Port of Portland Terminal 5
	 <b>HARTCROWSER</b>

**Attachment I**  
**1995 Solid and Hazardous Waste**  
**Determination and Disposal, Sandblasting Grit**  
**Port of Portland Terminal 5**

**SOLID AND HAZARDOUS WASTE DETERMINATION  
AND  
DISPOSAL ASSISTANCE**

**Sandblasting Grit Material**

Port of Portland Marine Terminal 5  
North Lombard  
Portland, Oregon

October 11, 1995

Prepared for:

Port of Portland  
Portland, Oregon

Prepared by:

Hahn and Associates, Inc.  
Portland, Oregon

HAI Project # 3089  
Port Project Number 51910  
Port Task Number 103

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- A     Solid/Hazardous Waste Characterization Worksheet - Waste Sandblast Grit Material
- B     North Creek Analytical Laboratory and Hughes Analytical Laboratory Data Reports and Chain-of-Custody Documentation
- C     Hillsboro Landfill Generator's Special Waste Profile Sheet and Sanifill's Special Waste Permit Management Decision
- D     Hillsboro Landfill's Transaction List - Permit 2396  
(dated 8/1/95 to 8/15/95)

SOLID AND HAZARDOUS WASTE DETERMINATION  
AND  
DISPOSAL ASSISTANCE

Sandblasting Grit Material

Port of Portland Marine Terminal 5  
North Lombard  
Portland, Oregon

October 11, 1995

**1.0 INTRODUCTION**

**1.1 Purpose**

The environmental management firm of Hahn and Associates, Inc. (HAI) was requested by the Port of Portland (Port) to sample, characterize, and to identify appropriate disposal options prior to final disposition of apparent waste sandblasting grit material located at Marine Terminal 5 (T-5), North Lombard, Portland, Oregon (Photograph #1 and 2). This report summarizes work performed under this project, and contains pertinent documentation including waste stream determinations, analytical data, and special waste profile sheets.

**1.2 Scope of Work**

The environmental management activities included the following five tasks:

- 1) Obtain samples of the apparent waste sandblast grit material for laboratory analyses.
- 2) Characterize the sandblast grit material as either hazardous or non-hazardous waste, based upon the analytical results and knowledge of the waste generation process.
- 3) Obtain approval for acceptance of the sandblast grit material at appropriate treatment or disposal facilities.
- 4) Coordinate the removal of the sandblast grit material from T-5 and to the ultimate disposal or treatment facilities.
- 5) Provide documentation regarding field activities, waste determination methodology, and treatment or disposal of the waste materials.

## 2.0 WASTE STREAM DETERMINATIONS

### 2.1 Waste Generation Process

The apparent waste sandblast grit material was investigated as discarded material which was hauled by truck to T-5 by Marine Terminal 6 (T-6) personnel as part of sandblasting activities associated with T-6 sandblasting operations. According to Mr. Pad Quinn, Marine Environmental and Safety Affairs Manager, there was no documented knowledge as to when the sandblast grit material was generated and transported to T-5.

### 2.2 Sampling Activities and Laboratory Analyses

On March 31, 1995, Ms. Jennifer Bach, a representative of HAI, obtained 9 representative samples of the sandblast grit material using hand augers and stainless steel trowels. Surface and sub-surface samples were obtained from the 13 piles of sandblast grit material. Sub-surface samples were obtained approximately 3 to 4 feet down into each pile. The 9 discrete samples were composited into four samples: 2910-033195-01 from Area 1, 2910-033195-02 from Area 2, 2910-033195-03 from Area 3, and 2910-033195-04 from Area 4 (Figure 1). The four samples were submitted to North Creek Analytical Laboratory, located in Beaverton, Oregon, for analysis.

Pursuant to Title 40 of the Code of Federal Regulations, Part 261.20 (40 CFR §261.20) samples 2910-033195-01, -02, -03, and -04, were analyzed to determine whether or not the apparent waste sandblasting grit material exhibited hazardous waste characteristics. Analytical tests relevant to hazardous waste characteristics included United States Environmental Protection Agency (EPA) Method 6010 for the presence of heavy metals using the Toxicity Characteristic Leaching Procedure (TCLP).

These samples (2910-033195-01, 02, 03, 04) were placed in 9-ounce glass sample jars, labeled with discrete sample identification numbers, and transported in a chilled cooler under chain-of-custody documentation to North Creek Analytical Laboratory for analysis.

At the direction of Mr. Pad Quinn, Port of Portland, on May 23, 1995, Ms. Jennifer Bach obtained an additional four discrete samples of sandblast grit material. The four samples were composited into two samples: 2910-52395-01 from Area 1 and 2, 2910-52395-02 from Area 3, and 2910-52395-04 from Area 4 were submitted to Hughes Analytical Laboratory, Gresham, Oregon for the presence of total heavy metals, using the EPA Method 3050. This analytical procedure was performed to further characterize the waste stream and to assist in further describing the waste stream for treatment or disposal.

These samples (2910-52395-01, -02) were placed in 9-ounce glass sample jars, labeled with discrete sample identification numbers, and transported in a chilled cooler under chain-of-custody documentation to Hughes Analytical Laboratory, for analysis.

The analytical parameters selected for each sample were pertinent to the waste characterization process. Decisions used in choosing appropriate analytical parameters were based upon the generator's knowledge of the waste stream. Sample numbers and the specific analysis selected for each sample are summarized in Table 1 (Summary of Analytical Results).

### 2.3 Analytical Results

After reviewing the analytical data for TCLP heavy metals detection, the sandblast grit material sample 2910-033195-01 was noted to contain 0.76 ppm barium and 0.79 ppm lead. Sample 2910-033195-02 was noted to contain 0.88 ppm barium, 0.037 ppm chromium, and 0.39 ppm lead. Sample 2910-033195-03 was noted to contain 0.97 ppm barium, 0.037 ppm chromium, and 0.61 ppm lead. Sample 2910-033195-04 was noted to contain 0.84 ppm barium, 0.038 ppm chromium, and 1.1 ppm lead.

According to 40 CFR §261.24 toxicity characteristic standards, the regulatory standard for arsenic is 5.0 ppm, barium 100.0 ppm, cadmium 1.0 ppm, chromium 5.0 ppm, lead 5.0 ppm, mercury 0.2 ppm, selenium 1.0 ppm, and silver 5.0 ppm. None of the samples contained concentrations of TCLP metals greater than or equal to these regulatory thresholds. A summary of the analytical results are referenced in Table 1.

#### 2.4 Waste Stream Determination

Subsequent to a review of the analytical data, the waste sandblast grit material was characterized in the form of a solid and hazardous waste stream determination. The determination is documented on an HAI Solid/Hazardous Waste Characterization Worksheet (worksheet). The worksheet identifies the source of the waste (if known), sample identification numbers, and the analyses that were performed for characterization purposes. The purpose of preparing the worksheet is to identify the waste stream as either a hazardous or non-hazardous solid waste.

Following the completion of the worksheet, it was determined that the sandblast grit material could be classified as non-hazardous solid waste.

A copy of the Hazardous Waste Characterization Worksheet is included in Appendix A of this report. Copies of the North Creek Analytical and Hughes Analytical laboratory report and associated chain-of-custody documentation are included in Appendix B of this report.

### 3.0 WASTE TREATMENT OR DISPOSAL

#### 3.1 Non-Hazardous Waste

Upon review of the analytical data, the waste sandblast grit material was accepted by Sanifill Northwest, Hillsboro Landfill, a Resource Conservation and Recovery Act (RCRA) Subtitle C landfill, located in Hillsboro, Oregon for disposal. The waste sandblasting grit material was accepted as an Oregon Special Waste, permit number 2396.

At the direction of Mr. Pad Quinn, Port of Portland, on August 9,10, and 11, 1995, Wark Trucking and Excavating, Inc. (Wark) excavated, loaded, and transported 503.53 tons of waste sandblast grit material to Hillsboro Landfill (Photograph #3 and 4).

On August 9, 1995, six loads of sandblast grit were loaded and transported by Wark to Hillsboro Landfill, totaling 165.64 tons of sandblast grit. On August 10, 1995, nine loads of sandblast grit were transported by Wark to Hillsboro Landfill, totaling 245.07 tons. On August 11, 1995 three loads of sandblast grit were transported by Wark to Hillsboro Landfill, totaling 92.82 tons.

Prior to the last load of sandblast grit material being transported from T-5 to Hillsboro Landfill, Wark leveled the excavation site to the surrounding grade (Photograph #5).

Copies of the Sanifill Generator's Special Waste Profile and Special Waste Permit Management Decision are included as Appendix C of this report. A copy of the Hillsboro Landfill Transaction List for Permit #2396 (dated 8/1/95 to 8/15/95) is included as Appendix D of this report.

A listing of the transportation date, total pounds, total tons, solid/hazardous waste determination, Hillsboro Landfill Permit number, and Permit expiration date is included in Table 2 of this report.

Due to a State and Federal Wetlands Boundary of Jurisdiction (SFB) located at T-5 approximately 35-40 tons of waste sandblast grit material remains on site at Terminal 5 within the wetland designated area (Figure 2). According to Mr. Quinn, the remaining sandblast grit material will remain on-site until the appropriate SFB is upheld to enable further removal of the remaining sandblast grit material beyond the wetland boundary (Photograph 6).

Sandblast Grit Material  
Waste Determination and Disposal Assistance  
Port of Portland, Marine Terminal 5  
Portland, Oregon

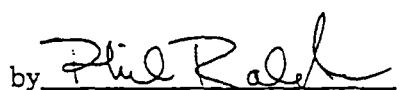
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October 11, 1995  
HAI Project No. 3089  
Port Prj/Task # 51910-103

Any questions regarding the information presented in this report are welcome and should be referred to the undersigned project manager. Thank you for the opportunity to be of service to you in this matter.

Hahn and Associates, Inc.

Project Manager

by   
Jennifer M. Bach  
Environmental Scientist

by   
Philip A. Ralston  
Principal

Sandblast Grit Material  
Waste Determination and Disposal Assistance  
Port of Portland, Marine Terminal 5  
Portland, Oregon

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#### 4.0 LIMITATIONS

The information presented in this report was collected, analyzed and interpreted following the standards of care, skill and diligence ordinarily provided by a professional in the performance of similar services as of the time the services were performed. This report is a work of opinion, therefore we can not offer any warranty regarding our conclusions, advice or recommendations.

TABLE 1  
SUMMARY OF ANALYTICAL RESULTS  
Sandblast Grit Material

Port of Portland  
Marine Terminal 5

(April 18, 1995 and June 12, 1995)

Expressed in parts per million (ppm)

Sample Number	Description	TCLP Metals	Total Metals
2910-033195-01	Area #1	Ba:.....0.76	Ar:.....1,250 Ba:.....1,440 Ca:.....62.7 Pb:.....6,180 Si:.....5.57
2910-052395-01		Pb:.....0.79	
2910-033195-02	Area #2	Ba:.....0.8	Ar:.....1,250 Ba:.....1,440 Ca:.....62.7 Pb:.....6,180 Si:.....5.57
2910-052395-01		Cr:.....0.037 Pb:.....0.39	
2910-033195-03	Area #3	Ba:.....0.97	Ar:.....515 Ba:.....782 Ca:.....1.24 Pb:.....3,960 Se:.....0.031 Si:.....3.86
2910-052395-02		Cr:.....0.037 Pb:.....0.61	
2910-033195-04	Area #4	Ba:.....0.84	Ar:.....515 Ba:.....782 Ca:.....1.24 Pb:.....3,960 Se:.....0.031 Si:.....3.86
2910-052395-02		Cr:.....0.038 Pb:.....1.1	
Regulatory Standards (49CFR)		Ba = 100.0 ppm Cr = 5.0 ppm Pb = 5.0 ppm	N/A

Notes:

- 1) TCLP Metals = Toxicity Characteristic Leaching Procedure (EPA Method 6010)
- 2) Total Metals = by EPA Method 3050
- 3) Ba = Barium
- 4) Pb = Lead
- 5) Ar = Arsenic
- 6) Ca = Cadmium
- 7) Si = Silver
- 8) Cr = Chromium
- 9) Se = Selenium
- 9) N/A = Not applicable

**TABLE 2**  
**SUMMARY OF SOLID WASTE DISPOSITION**

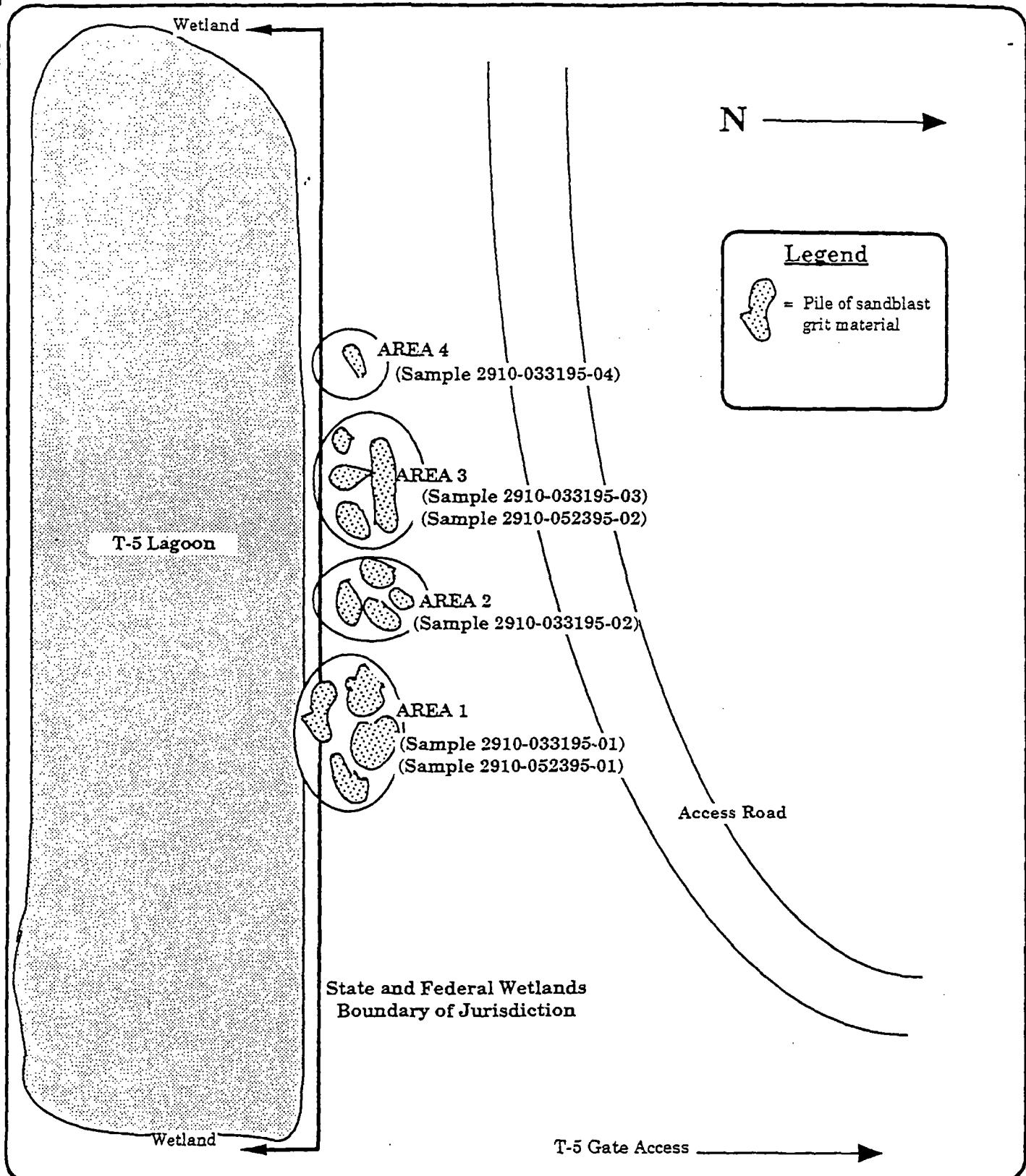
Sandblast Grite Material

Port of Portland  
 Marine Terminal 5

(September 22, 1995)

Date of Transport	Total Pounds	Total Tons	Solid/Hazardous Waste Determination	Permit Number and Expiration Date
8/9/95	35,860	17.93	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/9/95	57,700	28.85	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/9/95	50,660	25.33	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/9/95	78,380	39.19	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/9/95	45,240	22.62	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/9/95	63,440	31.72	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	69,020	34.51	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	47,640	23.82	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	49,640	24.82	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	72,420	36.21	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	44,700	22.35	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	45,340	22.67	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	53,420	26.71	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	64,440	32.22	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/10/95	43,520	21.76	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/11/95	46,760	23.38	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/11/95	62,540	31.27	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
8/11/95	76,340	38.17	Non-Hazardous Solid Waste	Permit #2396 Exp. Date-11/8/95
<b>TOTAL:</b>	<b>1,007,060</b>	<b>603.63</b>		

## **FIGURES**



HAI Project #3089	HAHN and ASSOCIATES INCORPORATED	Site Map and Sample Location	FIGURE
September 1995 Not to Scale	ENVIRONMENTAL MANAGEMENT 434 NW SIXTH AVENUE, SUITE 203 PORTLAND, OREGON 97209 503/796-0717	Marine Terminal 5 North Lombard Portland, Oregon 97203	1

**Attachment J  
Site Map  
Port of Portland Terminal 5**

